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For Contents See Page 1.

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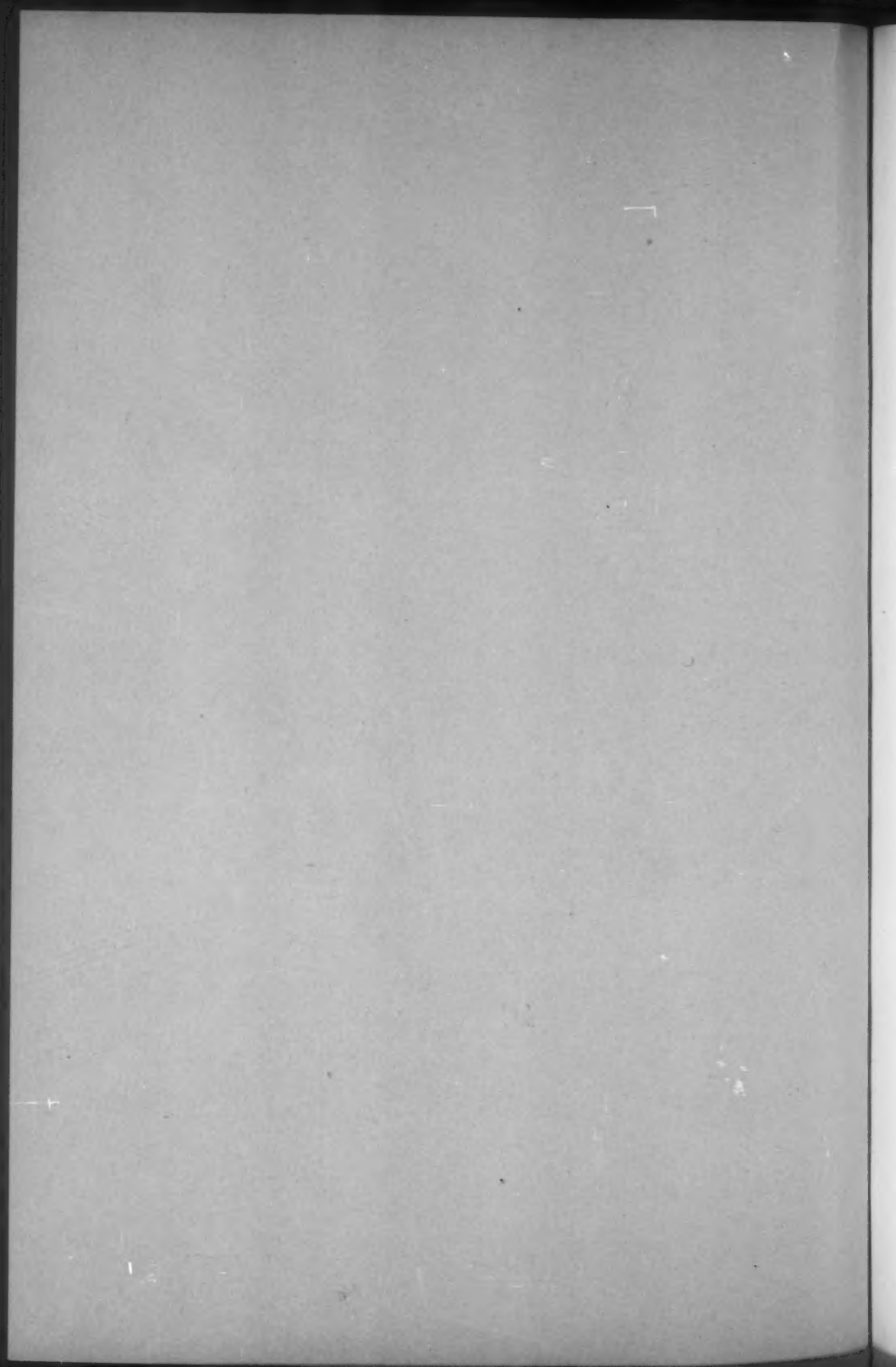
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## ORIGINAL COMMUNICATIONS.

(Original Communications are received with the understanding  
that they are contributed exclusively to THE LARYNGOSCOPE.)

### A METHOD FOR STUDYING THE ACTION OF THE VOCAL MUSCLES DURING PHONATION, WITH SOME EXPERIMENTAL RESULTS AND CONCLUSIONS.<sup>1</sup>

DR. L. E. DODD, Los Angeles.

*Introduction.*—Detailed studies of the different muscles controlling phonation have already been made by dissection of the cadaver, to make clear their structure and interrelations, and thus indirectly, and as far as possible by that means, their functions. But for additional light on the physiological processes, it is desirable to study in the greatest detail experimentally feasible, the vocal muscles in action during the sounding of a tone by the living subject. A method of approach of this kind is to note the effect upon a vocal tone, of external pressure locally and somewhat abruptly applied to various places on the throat during phonation. Such an approach was made by the work to be reported here.

Not only will the particular method used in the investigation be shown practicable, but in addition data will be presented sufficient to permit the drawing of certain conclusions. These conclusions are of a general nature in that they apply consistently to five individual subjects, each studied at two different pitches, using eight vowels on each pitch.

For any readers not familiar with the subject of sound and methods available for its experimental study, and also as a background

1. This material, much condensed, was included in a paper presented before the American Physical Society, Pacific Coast Section, at the Pasadena meeting, March 7, 1925.

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for presenting the results obtained, it has been thought desirable to devote, in the first part of the paper, a proportionately large amount of space to physical basis and experimental method, treating them, however, in a general way.

#### THE PHYSICAL ELEMENTS OF MUSICAL TONE.

Regardless of how it may be defined or described nontechnically, or from the psychological standpoint of sensation, from the physical standpoint any musical tone consists of but three factors, or characteristics, each of which is always present, viz., 1, *pitch*, or vibration frequency; 2, *loudness*, or intensity, and 3, *quality*, timbre, or "color."

Since, physically, a musical tone consists entirely of a train of sound waves in some material medium, such as air, these three characteristics are in reality characteristics of the waves, and therefore will be discussed briefly with reference to the physical wave train.

A sound wave is merely a disturbance in a material medium, travelling through it with a definite velocity. In its simplest form it is either an individual compression, or an individual rarefaction, but usually both, one immediately followed by the other. The wave train of a sustained sound is a sequence of such compressions and rarefactions, all moving through the medium at the same rate. They advance continuously through the medium with the velocity of sound, while the particles of the medium, unlike those of water in the case of water waves, oscillate in the line of this advance about their respective positions of "equilibrium." The regions of compression may be regarded as "wave fronts."

No matter how closely any given wave precedes or follows one next it, this circumstance does not at all affect its velocity, which is the same as that of all the other waves. The common velocity of the sound waves depends upon temperature and humidity, and to the degree to which these conditions remain constant, the velocity of the waves remains constant also.

Although the particles of the medium have oscillatory motions in the line of advance of the sound waves, the wave train can be represented graphically in a "wave curve" as transverse, i.e., one in which the oscillatory motions of the particles are restricted to a direction at right angles to the line of advance of the waves. Water waves are chiefly of the transverse type, but to some extent longitudinal also, a given particle, or droplet, of the water moving in an elliptical path lying in a vertical plane, the long axis of this path being vertical.

Such a graphical transverse wave form has a wave length proportional to that of the sound wave train it represents, a height proportional to the extreme displacement of the vibrating particles, and



a shape that is dependent upon, and constitutes a kind of picture of, the particular oscillatory motion of the particles. By having in mind such a graphic wave form, we may refer to the "height" of the sound waves, and the "shape" of the wave train, as well as to its wave "length."

The three characteristics of a musical tone may now be defined and discussed in terms of the physical wave train alone.

1. *Pitch.* The pitch is determined by the "vibration frequency," which means the number of vibrations per second of the source primarily. But also, the frequency of the source is equal to the common oscillation frequencies of the particles of the medium, and to the rate at which the successive waves pass any fixed position in the medium. It is therefore the rate at which they come into the ear of a stationary observer, supposing the source of the sound to be stationary.

The frequency is bound up with the wave length in the following manner. Since the velocity of the wave is equal to the distance it travels in one second, the velocity must be equal to the frequency, or number of waves per second passing a fixed position, multiplied into the common distance between them. Thus the frequency and the wave length vary inversely. Specifically, if the frequency is doubled, the wave length is cut in half; if it is tripled, the wave length is reduced to one-third its first value; and so on. More generally, if the frequency increases, the wave length decreases, so that the higher the pitch of the tone the shorter its wave length.

2. *Loudness.* The loudness of a musical tone depends upon the "height" of the wave, or amount of extreme displacement of the medium's vibrating particles from their equilibrium, or "at rest," positions, where they would remain but for the presence of the waves they are transmitting. (This statement neglects the random motions of molecules due to temperature.)

3. *Quality.* The compressions and rarefactions in motion are conditions that accompany the oscillations of the particles of the medium. These oscillations are contributions by the particles to the movement of the wave train through the medium. The tone quality depends upon the particular nature of these oscillatory motions, which nature is indicated by the shape of the wave curve.

Briefly, then, the three characteristics of a musical tone on the physical side are characteristics of a physical wave train, that can be represented graphically by a plotted "wave curve." On this curve is represented the wave "length," the wave "height," and the wave "shape," which correspond respectively to the *pitch*, the *loudness*, and the *quality* of the musical tone.

Since, on the physical side, any musical tone is made up wholly of these three physical elements, it can be completely described in terms of them. Likewise, any variation in a given tone can be described in the same terms. Any effect upon a vocal tone being sounded must be a change in any one, or a simultaneous change in any two, or all three, of the characteristics.

PHYSICAL MEANS OF STUDYING TONE AND OF DETECTING TONAL CHANGES.

Although the ear is quite sensitive to detect change, especially abrupt change, in a sustained tone, it cannot be relied upon, in all cases at any rate, to differentiate slight changes in these characteristics, particularly where changes in all three occur at the same time, which is frequently the case.

As to mechanical devices available for detecting such changes with certainty, the phonodeik<sup>2</sup> developed comparatively recently by Professor D. C. Miller, of the Case School of Applied Science, Cleveland, should be mentioned first. It is an exceedingly sensitive instrument that permits, to a high degree of precision, detailed analysis of a tone in the three respects mentioned. The method consists in photographing the visible curve, or wave form, produced by the instrument and corresponding accurately and in great detail to the character of the sound. In a very real sense this visible wave form curve is a picture of the sound, presenting to the eye what the sound itself presents to the ear. Where one observes the wave form directly, rather than its photograph, the two presentations are simultaneous,<sup>3</sup> and the observer both "sees" and hears, at the same time, the tone being sounded.<sup>4</sup> Thus, even one who has little or no musical talent or training can readily observe variations in the three fundamental characteristics of tone. But for a reliable recording of slight variations, with which we are chiefly concerned in work such as the present, it is necessary to obtain the photograph of the wave curve for more leisurely detailed study with auxiliary apparatus of special nature. The use of the phonodeik in this way is desirable because of the completeness of the record obtained, faithfully and precisely representing all three characteristics of the recorded tone.

As to available instruments dealing with any one of the three tonal characteristics to the practical exclusion of the other two there is none that pertains alone to the *quality* of the sound. However, the phonodeik is by far the most efficient device<sup>4</sup> for a study of quality. But for precision quantitative work it must be adapted photographically. Two instruments giving direct readings of the *loudness* of the tone are the Rayleigh disc,<sup>5</sup> and the Webster phono-

meter.<sup>6</sup> The latter is a more recent instrument, developed by the American scientist, the late Arthur Gordon Webster, for measuring the intensity of even very feeble sounds. In this instrument the diaphragm is of glass, mica or other suitable material. With a special adaptation displacements of the diaphragm down to  $1/24,000$  m.m., or  $1/609,000$  inch, can be detected. Any satisfactory device for measuring precisely the loudness of a sound, must be able to respond to a very small amount of energy. How small an amount is indicated by a calculation of Webster's based upon measurements with the phonometer. He found that a single horsepower represents all of the energy in the sound waves from ten million cornets playing fortissimo. In other words, one ten-millionth of one horsepower supplies enough energy for the sound waves from a cornet being played at its very loudest.

A precise general method for indicating the *pitch* of a musical tone at the time of its sounding, is that of the stroboscopic effect,<sup>7</sup> which will not be described in much detail here. It is a method that may be regarded as indicating pitch exclusively, a matter that will be discussed in brief presently.

#### GENERAL METHOD BY STROBOSCOPIC EFFECT.

Regarding the general method of pitch determination by the stroboscopic effect, or stroboscopy, it may be sufficient here to state by way of description, also general, that where flashes of light fall periodically upon a series of parallel rows of dots all moving at the same rate in the common direction of the rows, but each row having its own dot spacing, that moving row will appear to stand still which has a dot frequency equal to the frequency of the intermittent illumination. By "dot frequency" is meant the number of dots per second passing a fixed point. Moreover, it will appear to stand still if the light frequency is either a multiple or a submultiple of the dot frequency, although the apparent spacing of the dots will not be the same in all cases. Thus, if the frequency of the periodic light source is known, the dot frequency of the apparently stationary row may be found. Conversely, if the dot frequency of the apparently stationary row is known, the light frequency may be determined.

A source of light can be made to vary in brightness periodically according to the pitch of a sounded tone, so that the light frequency and the pitch of the tone are the same. This is done in the present application. Then if the pitch range with which one is working is known approximately, and the dot frequency is known precisely (matters presenting very little difficulty), the pitch of the tone is very accurately and precisely determined, for a variation of a tenth,

or even a smaller fraction, of a vibration, between the tone and the dot frequencies, is discernible. The degree of precision with vocal tones is evident, when it is remembered that their range of frequencies is roughly from 60 to 1040 vibrations per second. The dot frequency of a given row depends upon two things: *a*, the dot spacing in the row, and *b*, the rate of motion of the "stroboscopic screen," or surface carrying the rows of dots. Thus a knowledge of these two quantities is all that is necessary for obtaining the dot frequency.

It was stated above that the stroboscopic method may be regarded as indicating pitch exclusively. However, it should be noted that since the overtones together with the fundamental determine quality, and since each overtone has a definite frequency and thus might give its own stroboscopic response, quality can be said to have its effect upon the character of the stroboscopic image, or row of apparently stationary dots. But only a rough idea of the quality could be obtained in this way. Thus the stroboscopic method may be regarded as having to do exclusively with the pitch of the fundamental, or partial of lowest frequency. The pitch of the fundamental is what is commonly meant by "the pitch of a sounded tone."

#### DEVICES FOR TONAL ANALYSIS BY STROBOSCOPIC EFFECT.

A light source is made to vary in brightness periodically according to the pitch of a sounded tone, by communicating to the source the vibrations of a diaphragm that moves under the influence of the sound waves. Since the kind of motion communicated to the diaphragm depends upon the character of the sound waves, the vibrations of the light must take on that same character also, and the frequency of the light flashes will be the same as that of the sounded tone.

The well-known manometric flame is a device of this kind. The diaphragm subject to vibration serves as part of the wall of the gas chamber in the burner. The mechanical connection between diaphragm and flame is supplied by the unignited gas that streams over the inside face of the diaphragm to the small orifice where it emerges to the outside air and enters the flame.

A second means<sup>a</sup> is by reflection of a nonhomogeneous light beam from a mirror attached to the vibrating diaphragm. In this case the brightness of the source is invariable with time, but the light varies in some suitable way over the transverse section of the beam. This nonhomogeneous character must be imparted to the beam at some point not farther removed from the source than the vibrating mirror.

Finally, a narrower beam of light from a steady source, and homogeneous, or approximately so, over its transverse section, is reflected from a small mirror that vibrates with the diaphragm, and plays over one or more rows of dots on the stroboscopic screen. Since the beam is limited in size, the stroboscopic effect is seen over a smaller area on the screen. (The same stroboscopic screen might be used for all these methods.) Such a screen has been developed for attachment to a phonograph of the disc record type.<sup>9</sup>

Miller's phonodeik (l.c.), already mentioned as giving, with great sensitiveness and precision, a most complete record of a tone, employs a small mirror in this way. The phonelescope<sup>10</sup> designed by Dorsey is similar in principle. It is not so sensitive as the phonodeik, and therefore is not available for quantitative tonal analysis of the very highest precision. However, it possesses considerable sensitiveness. In precision as a pitch indicator when used stroboscopically, it belongs, because of the nature of the stroboscopic effect, to the same class as the phonodeik would if used in this manner. Moreover, it is an instrument readily available and inexpensive. It was therefore chosen for the work to be set forth in this article.

A more detailed description of the apparatus as assembled for the present work, including the brass cylinder carrying on its surface the row of dots, and specially built to be run on an Edison recording phonograph of the cylindrical record type, will be found elsewhere.<sup>11</sup>

To summarize, any device for tonal analysis making use of the stroboscopic effect responds to pitch only, which it indicates with high precision. Since it makes possible a decision on the basis of what is seen, not what is heard, it affords an objective test.

#### PROCEDURE IN THE PRESENT WORK.

The procedure is for the subject to sound and sustain a tone on a prescribed pitch, so that by stroboscopic response one of the parallel rows of dots on the stroboscopic cylinder appears stationary. External pressure is applied locally and somewhat abruptly at a selected place on the throat, and if the row of dots moves, it is known the pitch has changed, and by the direction of their motion it is at once known also whether the pitch change was upward or downward. Because of its simplicity and directness, any error in the "qualitative" test is next to impossible.

To simplify the procedure, the places chosen on the throat for applying the pressure were limited to a median line following from the angle beneath and back of the chin down to the farthest point on the trachea accessible externally, in the U-shaped depression at

the upper end of the breastbone. Ten definite localities lying upon this line were at first selected, as shown in Fig. 1. The pressure was applied with the fingertip, which is a desirable method, because the sense of touch makes certain the particular locality of the throat subjected to the pressure.

The vocal tone was sounded with average loudness, but no effort was made to keep the loudness constant, nor any quantitative check on the intensity kept. In tests such as these the maintaining of constant intensity, with the aid of an intensity indicator of the type of either of those mentioned, might be desirable, since it is a usual principle of experimental procedure to keep constant as many as possible of the various factors affecting the results. But in the present work, the conclusions reached could hardly have been af-

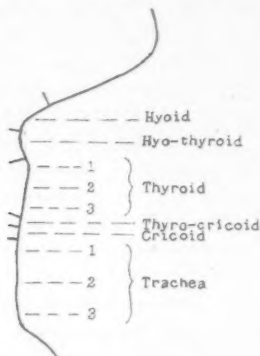


Fig. 1. Points of pressure application on throat (schematic diagram).

fected by the absence of a mechanical loudness control, for the results showed marked consistency. Constant quality would be difficult to realize with different voices, but the use of definite vowel sounds insured at least the general predominant quality characteristic of each particular vowel, so that the different voices on the same vowel can be regarded, but in that sense only, as having constant quality.

Three men subjects were first studied, a tenor, a baritone, and a bass, each on two different pitches, making six cases in all. Two additional subjects, both men, were studied later, and they will be mentioned again in what follows. The pitch at all times was obtained from Gaertner forks, and the dominant quality of the sustained tone, by the use of eight vowel sounds given in the "vowel pyramid"<sup>12</sup> presented in Miller's book. This particular series, which

Miller designates as "a rational selection of standard vowels," has a definite and unquestionable scientific basis, viz., a "nearly uniform distribution of resonances" (pp. 226-7). The vowel sounds, given in conjunction with the consonants *p* and *m*, are: 1, oo (pooh, moo); 2, oh (poe, mow<sup>13</sup>); 3, aw (paw, maw); 4, ah (pa, ma); 5, a (pat, mat); 6, e (pet, met); 7, a (pate, mate); 8, ee (peat, meet).<sup>14</sup>

According to this scheme, each case investigated requires at least eighty separate applications of pressure. As the work proceeded, it was found desirable, however, to abbreviate the scheme in a manner to be described.

#### QUALITATIVE DATA AND RESULTS.

The "qualitative" data from the present work indicate the direction of the pitch change resulting from the pressure, but not its amount. Although the stroboscopic method makes possible, within limits, quantitative measurements that show how much the pitch has changed, such work, being necessarily more complicated, would require much more time for the observations. Furthermore, the qualitative data take no account of the amount of the pressure necessary to cause the pitch change. However, the necessary pressure was not great. This is apparent in the "quantitative" data to be presented under the next heading.

The first three cases (Table 1 (a), (b), and (c)): tenor, A<sub>2</sub> 214; baritone, C<sub>2</sub> 128; bass, F<sub>2</sub> 171; were investigated quite completely. It was soon found that even large pressure in the hyoid region causes little or no effect on the pitch. Pressure on the hyothyroid membrane gives, if any, the same effect as pressure on the thyroid cartilage, an indication that the effect here is due to pull on the thyroid (Adams' apple). The intermediate regions of both the hyothyroid and the thyrocricoid membranes might be expected to give results somewhat ambiguous to interpret, since pressure on either must affect to a degree both the region just above and that just below it. Pressure applied at the three different points on the thyroid—tip, middle, base—gave the same result in the three positions, a lowering of the frequency. Such uniformity is to be expected here, as this cartilage forms a box of considerable rigidity, and must move to a high degree as a whole. Pressure on the intermediate thyrocricoid region showed in general the same effect as before, indicating in view of results with the cricoid that the indirect effect of pressure on the thyrocricoid membrane is principally upon the region immediately above it, that is, the thyroid cartilage.

The effect of pressure on the cricoid cartilage was opposite to that elsewhere. For the tenor, A<sub>2</sub> 214, there was no tendency to a



lowering of the pitch, and three out of the eight cases showed a rise in frequency. The baritone,  $C_2$  128, showed a consistent definite rise in the pitch in all eight cases, and the bass,  $F_2$  171, likewise. Pressure on the three points of the trachea gave very consistently for all three voices a lowering of the frequency.

Next, each of the three voices were tested at only what may be regarded, in the light of the foregoing results, as the three main positions: thyroid-1 (tip of the apple), cricoid, and trachea-2. The results (Table II), obtained this time on a pitch for each voice different from that before, were consistent with the first results, except that the tenor,  $E_2$  160, now showed a definite rise in frequency by pressure on the cricoid, for every one of the eight vowels.

For these three voices the generalization can be made that pressure either on the thyroid or on the trachea causes a lowering in the pitch of a sustained vocal tone, while pressure on the cricoid shows no lowering of the pitch, but in five cases out of the six, a consistent raising of the pitch. The generalization includes what may be called the eight principal vowel sounds, but is limited to two definite frequencies for each voice, one at about the center of the vocal range, the other a fourth below this.

The change of pitch caused by pressure on the cricoid is not surprising. The cricoarytenoid muscles are attached to the cricoid at the sides and toward the rear. These move the arytenoid cartilages that in turn largely govern the approximation and tension of the vocal cords. Apparently, pressure on the cricoid causes, by a movement of these muscles, an increased tension on the cords. Or conceivably there might result indirectly increased "compression," that is, a shortening of the vibrating lengths of the cords. (It is noticeable that the cricoid response in general seems to be heightened when the pressure is applied rather in the upward direction.)

At times, when the pressure was not too great, nor kept too long applied, an elastic return to the original pitch was noted upon release of the pressure. This suggests a distinction that perhaps should be made, theoretically at least, between 1, difference in pitch due to physical deformation caused by the pressure, and hence a change in the shapes and the tensions of the muscles because of such deformation, and 2, difference in pitch due to a change in the degree of muscular contraction brought about indirectly by the disturbance.

Some time after the paper, mentioned in the first footnote of the present article, was read, additional qualitative data were obtained from two new subjects, a baritone at  $F_2$  171 and  $C_2$  128, and a tenor at  $E_2$  160. Results were the same as those with the first three sub-

jects. The baritone,  $F_2$  171, on *ä* and *ee*, cricoid, gave questionable response. The tenor, a younger person, was very sensitive to the test. His throat structures were softer, much more easily yielding to pressure, than those of the other subjects. In physical build he appeared less robust. At this point the question suggests itself as to the degree of dependence of the mechanical resistance to pressure of the throat structures (thyroid cartilage, etc.) upon age, physical build, and whether the person is a tenor or a bass.

Incidentally, it may be mentioned that another younger tenor seemed to have no Adam's apple, judged from external appearance, so little prominent was the thyroid cartilage. Also, one of these tenors seemed to find it impossible in coming to the initial pitch, to change the pitch of the tone he was sounding, by an amount less than a semitone, so well, even too well, had he learned the semitone interval.

#### QUANTITATIVE DATA AND RESULTS.

The data to be given next is "quantitative," not as to the amount of the pitch change, but rather the amount of pressure needed to cause such change. These data were obtained somewhat incidental to the qualitative work reported above.

Some measurements on one subject, the bass (C),  $F_2$  171, were made with a simply constructed dynamometer, which applied the pressure and indicated its amount. This instrument consisted of a length of brass tubing enclosing a helical spring stayed at one of its ends, and compressible by a thin stiff rod movable along the tube axis. At the outer end of this rod was fixed a brass cap one-fourth inch in diameter. In use the dynamometer was held by the tube body in the hand of the operator, and in the horizontal position. The force was applied to the subject by pressure of the cap against the throat. The central rod, moving a definite distance, depending on the pressure, pushed out a hollow, plunger-type indicator similar to that of an air gauge for automobile tires. The plunger was graduated on its outside surface. The end of the outer tube itself provided the index point. Calibration was in grams.

Table III gives the results for the particular case, that of a more mature singer, the bass in the foregoing qualitative tests. A pressure of from 70 to 105 gm. sufficed to cause unmistakable pitch change. The minimum values obtained for the eight vowels were: *oo*, 90; *oh*, 63; *aw*, 75; *ah*, 90; *ä*, 90; *e*, 90; *a*, 90; *ee*, 104 gm. Corresponding minimum values for the other two subjects of the qualitative tests would probably have been found appreciably lower than these.

Judged from the qualitative tests it is probable that the minimum pressure necessary to produce pitch change will be found to vary within quite wide limits for different individuals. It is certain that in the case of the tenor mentioned above as having very yielding throat structures, the amount of pressure required was much less than these figures. Younger persons would be expected to be more sensitive in this respect.

#### CONCLUSION.

The general conclusion from the present experimental work is that external pressure applied locally and rather abruptly either on the thyroid at any point, or on the trachea at any accessible point, causes a lowering in the pitch of a sustained vocal tone, while pressure on the cricoid shows no very appreciable lowering of the pitch, and almost invariably a rise in the pitch. This generalization is applicable to eight vowel sounds as given in Miller's vowel pyramid, and is limited for the time being by the scope of the present work, to two definite frequencies for each voice, one at about the center of the vocal range, the other a fourth below this. The direction but not the amount of the pitch change was determined. An incidental and brief quantitative study on only one subject, a mature bass singer, showed that in this single case the amount of external pressure, applied as stated above, necessary to bring about the pitch change, was about 75 to 100 gm. (approximately, a force of from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  oz.).

The results indicate that further investigation of the voice in this manner will be justified by specific data capable of interpretation. A complete study is warranted that will include a considerable number of voices, both men and women, of all three of the principal types in each case (soprano, mezzo, contralto; tenor, baritone, bass), using different vowel sounds, such as the present list of eight, if not a larger list, and covering the whole vocal range, so that all "registers" are included. Also, other localities of the throat besides those on the median line should be investigated. For certain localities of the throat studied in this way it might be found desirable to restrict further the area affected by the pressure, through the use of a special mechanical device smaller in size than the fingertip.

The vocal mechanism, while apparently simple in its action, is in reality complex. Quite a number of different muscles control or affect the behavior of the vocal cords, and a somewhat different avenue of approach to their functioning, even though that approach is indirect, should be of value in the further study of a subject not completely understood.

Acknowledgments are due the following, who gave their time as subjects of the tests: R. Anderson, G. C. Anthony, Dr. V. O. Knudsen, M. A. Koontz and G. W. Mercereau.

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3. "Simultaneous" to the degree that the time required for the light and also that for the sound to reach the observer are both negligible.
4. A recent interesting modification of the phonodeik should be mentioned. S. H. Anderson, of the Department of Physics, University of Washington, Seattle, has developed an acoustic oscillograph of the mechanical type which employs neither a horn nor a tension spring attached to the diaphragm. See *Journal of the Optical Society of America and Review of Scientific Instruments*, 11, July, 1925, p. 31.
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12. *The Science of Musical Sounds*, p. 230.
13. Vowel sound as in "know."
14. Nine vowel sounds altogether are included in the pyramid, but for the present work the sound of o as in pot, hot, has been omitted, since it is not far removed from ah. This sound was omitted by Miller from the table on p. 218, *The Science of Musical Sounds*.

The Physics Laboratory, University of California,  
Southern Branch.

TABLE I—QUALITATIVE TESTS.

(a) Tenor (A)		Pitch, A <sub>2</sub> 214						
		Vowel						
Pressure on	oo	oh	aw	ah	ä	ẽ	ā	ēē
Hyoid	O	?	X	X	?	?	X	X
Hyo-thyroid	-	-	X	?	?	?	X	X
Thyroid-1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
Thyro-cricoid	-	-	-	-	-	-	-	-
Cricoid	*	*/	?	*/	?	?	?	?
Trachea-1	O	-	-	-	-	-	-	-/
2	O	-	-	-	-	-	-	-/
3	*/	-	-	-	-	-	-	-/

## Symbols

O, no response

?, effect small in magnitude and questionable

X, no test

-, pitch change downward

\*, pitch change upward

/, small effect

(b) Baritone (B)		Pitch, C <sub>2</sub> 128						
		Vowel						
Pressure on	oo	oh	aw	ah	ä	ẽ	ā	ēē
Hyoid	O	-	?	?	X	X	X	X
Hyo-thyroid	-	-	-	-	X	X	X	X
Thyroid-1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	?	-	-	-	?	?	-	-
Thyro-cricoid	*	-	-	-	-	-	-	-
Cricoid	*	*	*	*	*	*	*	*
Trachea-1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-

TABLE I—QUALITATIVE TESTS (Continued).

Pressure on	(c) Bass (C)		Pitch, F <sub>2</sub> 171					
	Vowel							
	oo	oh	aw	ah	ä	ẽ	ā	ēē
Hyoid	O	?	O	?	?	X	?	?
Hyo-thyroid	?	-	-	-	-	X	?	-
Thyroid-1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	?	-	-	-	-	-	-	-
Thyro-cricoid	*)	*)	-	-	-	-	-	-
Cricoid	*)	*)	*	*	*)	*)	*	*
Trachea-1	-	-	-	-	-	-	-	-
2	?	-	-	-	-	-	-	-
3	?	?	-	-	-	-	-	-

Symbol

), very pronounced effect

TABLE II—QUALITATIVE TESTS.

Pressure on	Vowel							
	oo	oh	aw	ah	ä	ẽ	ā	ēē
Tenor (A) E <sub>2</sub> 160								
Thyroid-1	-	-	-	-	-	-	-	-
Cricoid	*	*	*	*	*	*	*	*
Trachea-2	-	-	-	-	-	-	?	O
Baritone (B) F <sub>2</sub> 171								
Thyroid-1	-	-	-	-	-	-	-	-
Cricoid	*	*	*	*	*	*	z	*
Trachea-2	-	-	-	-	-	-	-	-
Bass (C) C <sub>2</sub> 128								
Thyroid-1	-	-	-	-	-	-	-	-
Cricoid	*	*	*	*	?	*	*	*
Trachea-2	-	-	-	-	-	-	-	-

Note—A brief, slight opposite effect at first was observed on vowels ā and ēē, cricoid, baritone, and on vowel ä, thyroid, bass. In case marked "z" (vowel ā, cricoid, baritone) the stroboscopic effect was ambiguous due to complexity of the vibration.

TABLE III—QUANTITATIVE TESTS.

Bass (C)		F <sub>2</sub> 171		Dynamometer used	
Position, Thyroid-1					
Vowel	Pitch change	Reading	Grams (cor.)	Remarks	
oo	-	9.9	140		
	-	8.0	117		
	-	6.0	90		
	?	5.2	78		
	-	8.0	117		
oh	-	8.0	117		
	?	5.0	75		
	-	8.0	117		
	-	4.9	63	{slight abrupt negative pitch change, then back	
	?	6.5	96		
	-	9.5	136		
	-	12.8	180		
-	7.0	102			
aw	-	5.0	75		
	-	8.0	117		
	O	4.0	63		
	-	7.8	114		
	-	7.1	104		
ah	-	6.3	92	{slight abrupt negative pitch change, then back	
	-	6.0	90		
	-	6.6	97		
	O	3.0	49		
	-	6.0	90		
	?	2.3	39		
	?	3.0	49		
	*	5.0	75		
	*	7.0	102		
( a	O	7.0	102		
	- (?)	6.0	90		
	-	12.0	170		
	?	10.0	145		
( e	-	6.0	90		
	-	8.0	117		
	-	7.0	102		
- a	?	3.0	49		
	?	11.0	157		
	-	12.0	170		
	?	9.0	130		
	*	9.8	141		
	-	13.6	192		
	-	6.0	90		
	-	10.0	145		
Vowel	Pitch change	Reading	Grams (cor.)	Remarks	
ee	-	17.0	237		
	-	7.1	104	effect small	
	O	11.0	157		
	-	8.0	117	pronounced	
	O	7.0	102		
	O	12.5	175		
	O	7.5	110		
	-	12.0	170	not abrupt	
	-	12.2	173		
	-	25.0	345	slight abrupt drop	
	?	10.0	145		
	-	18.0	250		

-, pitch change downward \* , pitch change upward



## GLOSSOPHARYNGEAL NEURALGIA.

DR. GEO. C. ALBRIGHT, Iowa City, Iowa.

The existence of the clinical entity, glossopharyngeal neuralgia, has been fairly definitely established during the past few years. Very few cases of this type of neuralgia are being reported in the literature and are undoubtedly rare. A complete and exhaustive study of the literature has been made in the last two years by Doyle<sup>1</sup> and by Adson.<sup>2</sup>

It should be noted that glossopharyngeal neuralgia has been described as almost identical with trigeminal neuralgia. The only difference is a slight difference in distribution of the pain. In our case, as in most of the other cases reported, the correct diagnosis was made after attempts to stop the trigeminal neuralgia had succeeded in anesthesia of the fifth without affecting the pain complained of by the patient suffering from glossopharyngeal neuralgia. A review of the literature shows that all of the methods for stopping trigeminal neuralgia have been employed by different clinicians before diagnosing the case as one of glossopharyngeal neuralgia. The third division of the trigeminus has been injected, the sensory root of the fifth has been cut, and the gasserian ganglion has been removed, all with the same result; anesthesia over the distribution of the fifth, but no relief from the spasms of pain.

In some of the cases reported, a definite trigger area has been found as in trigeminal neuralgia; in others, not. This area is usually in the tonsillar region, either between the fauces or at the junction of the anterior pillar and the base of tongue. In our own case we are inclined to believe that the failure to diagnose glossopharyngeal neuralgia is hardly excusable since a definite trigger area was found in the area supplied by the ninth nerve, irritation of which would start the spasms of pain and anesthesia of which would promptly control the spasms of pain.

The history of the case follows: Mrs. A. L., age 66 years, first consulted me in May, 1924, complaining of ear trouble. Examination at that time showed hearing in the right ear about two-thirds normal; in the left ear, practically gone. There was an acute Eustachian salpingitis, left. The diagnosis made at that time was of acute salpingitis, superimposed upon a chronic, dry catarrh of the

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middle ear and probably some auditory neuritis. This latter was based upon inability to hear above  $C_3$  with the left ear. Patient was advised to have treatment of the tubes and to be kept under observation for a time. In about a month's time her hearing had improved to normal in the right ear, and two-thirds normal in the left. An occasional treatment was given then until in October. At the time of the original examination it was noted that the tonsils were large for her age, with redness of the pillars, although no pus could be expressed from the crypts. Oct. 16, the tonsils were again examined and fluid pus found in the crypts, which could be expressed. The inability to hear the high notes continuing, the patient was advised to have the tonsils removed.

Oct. 18, she returned complaining of dysphagia and dysphonia. Examination showed the tonsils moderately inflamed, a little fluid pus in the crypts of each. Temperature was normal, larynx was normal. It was noted that the point of greatest soreness seemed to be on the right side at the junction of the palatoglossus with the base of the tongue. On Oct. 22, she returned again, stating that the point of greatest soreness seemed to have moved first up along the anterior pillar of the tonsil and later forward along the side of the tongue. The pain had now become slightly spasmodic in character, occurring once on Oct. 20 and several times on the twenty-first. There was no ulceration, no evidence of malignancy. It was noted at this time that anesthesia of the right tonsillar region stopped the spasms of pain. On Oct. 28, patient returned for removal of tonsils. This was done under local anesthesia without any difficulty, using the dissection method. After the removal of the tonsils, patient made an uneventful recovery. For about a week after leaving the hospital, that is, within ten days following the operation, patient had only the usual amount of pain and discomfort following tonsillectomy.

On Jan. 22, 1925, she first noted that the pain would start in her throat and radiate up to the right ear. A careful examination for evidence of malignancy was again made. Having had one case in which a malignancy of the tonsil had been ushered in and constantly accompanied by spasms of pain in this region, together with the age of the patient, made us apprehensive that such might be the trouble here.

The posterior lip of the orifice of the Eustachian tube was normal. Arytenoids and epiglottis were normal.

In the course of the examination, an applicator was pressed against the junction of the palatoglossus with the tongue, resulting in an acute spasm of pain similar to the attacks she had been having. Anesthesia of this area again completely relieved the pain. After

returning home, her family physician tried anesthesia of this area with indifferent success.

She returned Mar. 6, stating that the attacks of spasmodic pain, which started in her throat, radiating up into her ear and around the ear, especially over the side of the face, had continued. These attacks would be started by swallowing, taking a breath through the mouth, or even by talking. Attacks would last but a moment or two, but would occur several times a day. Pain was confined to the right side. This time the patient was referred to a dentist for examination of the teeth and a tentative diagnosis was made of *tic douloureux*. The dentist consultant, Dr. Fenton, had had considerable experience, having seen and cared for over two hundred cases of trigeminal neuralgia. After his examination, he regarded the tentative diagnosis of *tic douloureux* as quite certain and advised injection of the third branch of the fifth. Acceptance of this advice was deferred.

On Apr. 1, the patient returned. She had consulted another physician; was told that it was a case of trigeminal neuralgia, had been advised to have the nerve injected with alcohol, and this physician had attempted to inject the fifth at the foramen ovale, but was unsuccessful. The attacks of pain had become more severe and apparently a little more extensive, involving the teeth, but maximum pain was still localized in and around the ear. As she described it, the pain would start in her throat, shoot up into her ear, then around the ear and over the side of her face. The greatest severity, however, was always "right in the ear."

On Apr. 1, Dr. Fenton injected the third branch of the fifth nerve, at the foramen ovale. He succeeded in injecting the alcohol into the gasserian ganglion, getting complete anesthesia of all three branches of the fifth. He visited the patient three hours later, and much to his surprise the patient had had another spasm of pain in the throat and ear. This was reported to me at once. At this time, I made a tentative diagnosis of glossopharyngeal neuralgia. On looking up the literature, especially the four cases reported by Doyle, we felt certain that the case was one of true glossopharyngeal neuralgia.

The patient, her husband and the home physician were told of our diagnosis and that the only relief which could probably be obtained was to destroy the ninth nerve through the intracranial approach or by peripheral avulsion as described by Dr. Adson.

During April, the patient reported a number of times with recurring spasms of pain. She was quite certain that the pain started from a tooth, although there was fairly complete anesthesia over

the entire second and third divisions of the fifth. Acting on this belief, although contrary to our opinion and advice, she had a right lower bicuspid extracted, Apr. 25. May 21, she reported that she had had but one attack of pain since the extraction of the tooth. There was a little sense of fullness in the right ear, with a little discomfort, which seemed to start in the throat. There seemed to be a slight return of sensation over the third branch of the fifth.

On the morning of June 9, her home physician telephoned that the spasms of pain had started again with more marked severity and frequency. We asked the patient to consult Drs. Doyle and Adson at Rochester, Minn., for confirmation of diagnosis and treatment. This she did.

Dr. Doyle's examination confirmed the diagnosis of glossopharyngeal neuralgia and Dr. Adson advised section of the roots of the ninth. The patient could not consent to the operation and returned home on June 20.

From this time until Oct. 20, the patient enjoyed almost complete relief from any pain. She was able to eat and drink as usual and entertained great hopes that her trouble was ended. On the morning of Oct. 21, she was awakened by a severe attack of pain in her ear. Typical spasms of pain occurred during Oct. 21 and 22. She consulted me on the latter date and stated that the spasms of pain were more frequent and more severe than at any previous time. Our advice to have surgical interference was again repeated. Both she and her husband seemed now more ready to acquiesce and they left the office expecting to go to Dr. Adson for surgical procedure. In view of the rarity of the condition, I feel certain that he will report the further progress of the case.

Conclusions: 1. Glossopharyngeal neuralgia is as distinct a clinical entity as trigeminal neuralgia.

2. Differential diagnosis is seldom made early enough to save the patient from attempts to stop what is diagnosed as trigeminal neuralgia.

3. Careful study of the exact location of the trigger area, if one exists, as we believe it does in most cases, together with a careful study of the distribution of the pain, might make a diagnosis certain before any surgical procedure is attempted.

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400-417 Johnson County Bank Building.

## THE SIGNIFICANCE OF PAPILLEDEMA IN NEUROSURGERY.\*

DR. WILLIAM SHARPE, New York City.

In the diagnosis and surgical treatment of intracranial lesions, a competent ophthalmoscopic examination is possibly the most important single test in a neurological examination. Without a careful fundal investigation, no neurological examination is complete. This method of obtaining accurate information of the intracranial pressure has been greatly facilitated by the direct use of the various electric ophthalmoscopes—so superior in detailing the fundi as compared with the old indirect method of an interposed lens.

The term papilledema has been rather loosely used in denoting the degree of intracranial pressure. It has only been realized within recent years that an increased intracranial pressure of more than twice the normal could be present and yet the papilledema not to have reached the degree of measurable swelling and surely not the condition of "choked disks"—a papilledema of more than 2 D. It has only been since the use of the spinal mercurial manometer to register accurately the pressure of the cerebrospinal fluid at lumbar puncture, that the significance of the milder degrees and of the earlier stages of papilledema has been recognized; now, in the case of a suspected intracranial lesion, the opinion regarding an edematous blurring of the nasal halves and temporal margins of the optic disks as being within physiological limits or as due to an increase of the intracranial pressure, can be confirmed or disproven by a lumbar puncture, using the mercurial manometer to record the pressure—the most accurate method of determining the pressure of the cerebrospinal fluid that is known at present.

Normal fundi do not exclude naturally an intracranial surgical lesion and especially is this true of slowly growing infiltrating cerebral tumors of the gliomatous type and of the small cerebellopontine angle fibromata of the auditory nerve as well as of many cerebral abscesses even of large size. For an intracranial lesion to produce the condition of measurable papilledema to the degree of "choked disks" has indicated most frequently in my experience, either a more or less complete blockage of the ventricles or the presence of

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a large tumor formation. It is, however, the milder degrees of papilledema—the preliminary stages of a measurable swelling of the optic disks—that have been so frequently overlooked as being within physiological limits, so that many patients having a mild increase of the intracranial pressure during the early growth of a cerebral neoplasm, have been allowed to wait until a measurable papilledema even to the degree of “choked disks” occurred before the definite diagnosis of an increased intracranial pressure has been made—when the tumor surgically has become a large tumor.

The effect of an increase of intracranial pressure upon the fundus of the eye can be very easily demonstrated in its various stages by the experimental production of an internal hydrocephalus in dogs. In 1915, Dandy first used the method and his observations were confirmed and reported by me in 1917 in the following manner:<sup>1</sup> the condition of internal hydrocephalus was successfully produced in nine puppies of the age of 10 days to 2 weeks by means of a suboccipital exposure through which a small gelatin capsule filled with cotton was inserted into the aqueduct of Sylvius so that the cerebrospinal fluid could not escape from the third and lateral ventricles; a resulting hydrocephalus with dilatation of the ventricles and therefore an increased intracranial pressure occurred, so that it was possible with the ophthalmoscope to observe the changes in the fundus of the eye due to this increased intracranial pressure. Within five to six hours after the insertion of the cotton plug into the aqueduct of Sylvius, in each one of the puppies the retinal veins gradually became dilated; apparently the veins over the nasal half enlarged earlier and possibly more than the veins over the temporal half of the retinal fundus; this congestion and dilatation of the retinal veins was the first sign indicative of an increase in the intracranial pressure. Within two to four hours later, the nasal margin of the optic disk would become blurred, then the temporal margin, then the nasal half and finally the temporal half of the disk would become obscured, so that within a period of twelve to twenty-eight hours following the production of a definite increase of intracranial pressure, the details of the optic disks would no longer be observed; in four dogs the edema of the optic disks was so great within this period of time that a measurable swelling could be observed with the ophthalmoscope and thus the condition of “choked disks” could be applied; in the other five dogs, the measurable papilledema occurred from twelve to twenty hours later. In one dog this condition of internal hydrocephalus with high intracranial pressure was not relieved by a subsequent drainage operation, and it is

interesting to note that definite signs of a secondary optic atrophy began to appear nine weeks later; the remaining eight dogs were all drained through a subtemporal operation with six linen strands being inserted into the ventricle in order to relieve the condition of internal hydrocephalus; in all but three dogs, the increased intracranial pressure was relieved and it was most interesting to note that the subsidence of the choked disks was in just the reverse order of their occurrence, that is, the measurable swelling of the papilledema first disappeared, then the blurring of the temporal half and then of the nasal half of the optic disk; then the temporal margin and later the nasal margin appeared—though slightly blurred in all of the puppies; that is, the persistent dilatation of the retinal veins and some blurring of the nasal margins of the optic disks indicated that the intracranial pressure had not been entirely relieved by the operation. In the remaining three puppies the optic disks remained entirely obscured—only the measurable swelling disappeared, so that in these dogs the operation of drainage to relieve the condition of internal hydrocephalus was not successful.

In discussing the pressure signs observable in the fundi in the following intracranial conditions, the terms "blurring" and "edema" of the details of the optic disks are used to indicate the earlier stages of increased intracranial pressure, and its later stages of measurable swelling of the optic disk by papilledema, and then "choked disks" in the conditions of extreme intracranial pressure where the papilledema is greater than 2 or 3 diopters. These signs of increased intracranial pressure as exhibited upon the fundus of the eye have been registered and confirmed by a measurement of the pressure of the cerebrospinal fluid at lumbar puncture by a spinal mercurial manometer, so that when there is observed a blurring or edema of the nasal half of the optic disk in a patient following a head injury, or in a patient in whom a brain tumor or abscess is feared, or in a child following a difficult labor and convulsions occur so that an intracranial hemorrhage is suspected, then it is very important to record accurately the pressure of the cerebrospinal fluid at lumbar puncture; if the pressure of the cerebrospinal fluid too is shown to be increased and thus the ophthalmoscopic findings are confirmed, we can then reach a more accurate opinion of the intracranial status. Naturally, in normal fundi, blurring and mild obscuration of the details of the optic disk occur and are considered as being within physiological limits; especially is this true in myopia, but if this obscuration of the details of the optic disks is observed and then the measurement of the cerebrospinal fluid is performed at lumbar puncture by means of a spinal mercurial manometer (the



most accurate method now known to record the pressure of the cerebrospinal fluid) we are thus enabled to exclude those cases of so-called "normal" blurring of the optic disks.

There are certain intracranial conditions that frequently produce definite pressure signs observable in the fundus of the eye. I should like to mention them briefly in the following order: brain tumor, brain abscess, intracranial hemorrhage and cerebral edema following cranial trauma, and lastly the condition of hydrocephalus.

1. We all know the condition of "choked disk" and, if not relieved, its subsequent secondary optic atrophy in patients having the signs of intracranial tumor. For an intracranial lesion to produce a "choked disk," there must be high intracranial pressure, and I believe it is rare in cases of brain tumor for a choked disk to result unless the tumor has become of very large size, or it causes a blockage of the ventricles, and thus produces an internal hydrocephalus, such as the posterior midbrain tumors and the subtentorial tumors and cysts. It is comparatively easy to make the diagnosis of brain tumor at this stage of papilledema, and I feel that if these patients had been examined ophthalmoscopically early, then the more mild pressure signs observable in the fundus resulting from the smaller tumor mass would have been ascertained and the patient thus spared an impaired vision, if not blindness itself. The stage of "choked disk" must naturally be preceded by the earlier and milder stages of disk blurring and papilledema and should therefore be recognized as being more significant than being within physiological limits. Only too frequently is the surgically successful removal of a benign brain tumor possible, and yet the patient has already been irreparably damaged by the nonrecognition of its pressure signs until it is too late for a normal person to be obtained.<sup>2</sup>

2. In brain abscess there is a replacement and substitution of brain tissue, and thus, as in gliomatous tumors which infiltrate and replace brain tissue rather than push it aside, it is rare for definite signs of intracranial pressure to be observed in these cases, unless, as has been stated before, the ventricles are blocked, or a toxic infective meningitis occurs from the presence of the abscess; the condition of papilledema is of much more frequent occurrence in subtentorial and cerebellar abscess, but it is rare for a temporo-sphenoidal abscess—the most common location of brain abscess following the usual cause—an otitis media—to produce marked fundal changes even though the abscess may reach the size of an orange and even larger.<sup>3</sup>

3. Intracranial hemorrhage and cerebral edema following cranial trauma with and without a fracture of the skull and with or without

gross brain injury rarely produce a measurable papilledema to the extent of "choked disks." The reason for this is obvious; unlike brain tumor, hydrocephalus, and the other intracranial conditions which enlarge slowly and thus permit the brain and particularly the medulla to adapt themselves to a high increased intracranial pressure with little immediate risk, in many cases of cerebral trauma, the intracranial pressure rises most rapidly, so that the compensatory mechanism of the medulla has little time to adjust its vasomotor and respiratory centers to this increased pressure, and the result in these cases is death from medullary compression and then edema ("decompensation") before the development of "choked disks" is possible; if these patients could survive this greatly increased and rapidly produced intracranial pressure, then a measurable papilledema and "choked disks" would occur. In cranial trauma, "choked disks" do occur in the cases of large hemorrhage which have formed slowly, usually the extradural type of hemorrhage following a rupture of the middle meningeal artery. In these cases of intracranial pressure of comparatively slow production, the medulla can adapt itself to the pressure, and thus death does not occur before a measurable papilledema and "choked disk" are possible. In 1917, I operated upon such a case; the "choked disks" of 4 diopters developed five days after the basal fracture; at operation both an extradural and a subdural hemorrhage began immediately after the operative drainage of the intracranial hemorrhage, so that fifteen hours later there was present only an edema and blurring of all the details of the optic disks, but not a measurable swelling of the disks.

It is most rare in these cases of brain injuries with or without skull fracture for an edema of the optic disks to appear within six hours following the trauma, and particularly is this true of those patients in the various degrees of shock; the greater the shock, the less the arterial blood pressure and naturally even though a large intracranial sinus or vessel was torn, yet it would be difficult for any extensive hemorrhage to occur; just as soon as the intracranial pressure equalled this lowered blood pressure, then no more bleeding could occur because the intracranial pressure would now be equal and even higher than the blood pressure; as the patient rallied from the condition of shock, then naturally the blood pressure would become higher and then more bleeding would occur, and thus the signs of intracranial pressure, such as an edema of the disk outlines, would now be possible. In these cases the marked signs of shock usually last about four to six hours; and again, those patients who cannot survive the condition of shock—they usually die within six hours after the injury.<sup>4</sup>

In these cases of cranial trauma, it is not so important in the treatment to know the site and extent of the fracture, if present, and particularly if it is a basal fracture, as it is to ascertain the presence of an increased intracranial pressure, both by careful and repeated ophthalmoscopic examinations, and also by the measurement of the pressure of the cerebrospinal fluid at lumbar puncture by the spinal mercurial manometer. If there are definite signs of a marked increase of the intracranial pressure, such as an edematous blurring of the optic disks and twice the normal pressure of the cerebrospinal fluid and even more as registered by the spinal manometer, and especially the medullary compression sign of a lowered pulse and respiration rate, with an increased blood pressure—all other therapeutic measures of the expectant palliative type (repeated lumbar punctures of spinal drainage, dehydration by salins, etc., having failed), then I believe an early relief of this increased intracranial pressure by means of a simple decompression operation is advisable before the patient reaches the dangerous stage of extreme medullary compression and even edema and thus collapse of the medulla itself. If an operation is postponed in these cases until a "choked disk" occurs, then the ideal time for the operation will have been lost, and it is then very doubtful whether the patient will recover; besides, should the patient, having been subjected to an acute high intracranial pressure for a period of days, recover without an operation or at best a very late operation, then the danger of post-traumatic organic conditions is a serious one; these organic conditions, due to a prolonged increase of the intracranial pressure, are characterized by persistent headache, dizzy spells, changes of personality and emotional instability of either the excited or the depressed type, mental and physical lassitude and early fatigue, and in rare cases even epilepsy in its various forms—and all associated with an uneased intracranial pressure of chronic traumatic cerebral edema, and thereby differentiated from the traumatic neuroses.<sup>5</sup>

In the treatment of patients having head injuries, therefore, it is most important to establish the presence or absence of an increased intracranial pressure, whether that pressure is due to hemorrhage or cerebral edema, and that repeated ophthalmoscopic examinations are of the greatest importance in facilitating an accurate diagnosis and the early treatment of the condition. As in adults, so are diagnosed and treated the cases of intracranial hemorrhage in children and new-born babies.<sup>6</sup>

4. The ophthalmoscopic findings in cases of hydrocephalus depend largely upon the type of hydrocephalus—whether it is of the internal type, due to a blockage of the cerebrospinal fluid in the

ventricles and thus producing ventricular dilatation and its resulting high intracranial pressure, or of the external type of hydrocephalus which is the more common type and due to a blockage of the escape of cerebrospinal fluid from the general cerebrospinal canal through the walls of the supracortical veins—over 80 per cent of the cerebrospinal fluid being excreted in this manner—rarely causes a measurable papilledema, whereas the internal type of hydrocephalus can produce “choked disks” of extreme degree and its subsequent secondary optic atrophy. Fortunately, in little babies before the sutures have firmly united, the skull itself can enlarge and thus a natural compensatory “decompression” take place so that peripheral vision may not be impaired; a drainage operation, however, offers these children the best chance of improvement, however slight it may be.<sup>7</sup>

Beside the conditions already mentioned there are other intracranial lesions in which an ophthalmoscopic examination is of the greatest importance; in cases of the various forms of meningitis, as an aid in differentiating the types of apoplexy, and a most important finding in so many conditions—the presence of a negative fundus.

In conclusion, I may say that careful ophthalmoscopic examinations of the fundus are of the greatest importance in the differentiation of many intracranial surgical lesions; that the signs of moderate intracranial pressure should be recognized, and that it should be realized that “choked disks” occur only as the result of high intracranial pressure; that the measurement of the pressure of the cerebrospinal fluid at lumbar puncture by means of the spinal mercurial manometer is a most accurate means of determining the intradural pressure; and, lastly, the intelligent use of the ophthalmoscope, especially the direct method, should be much more intensively studied in the medical schools and in the hospitals than it is at present.

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- 20 West 50th Street.

## ATYPICAL MASTOIDITIS; REPORT OF THREE CASES WITH OPERATION.

DR. JOHN J. McLOONE, Phoenix, Ariz.

In surgical mastoiditis unexpected findings are not unusual. A hurried operation upon a patient with very urgent clinical symptoms may disclose a pathologic condition not at all proportionate to the apparent severity of the case; on the other hand, what appears to be the most innocent case may show advanced and dangerous lesions in the mastoid process.

The clinical problems that confront the surgeon in cases of mastoiditis are quite varied. He may see the frank case with all the classical symptoms and the positive indications for operation; such cases offer little diagnostic difficulty. On the other hand, he may be puzzled by one of the atypical forms, that is, cases in which the clinical picture is obscured by the absence of the characteristic signs of the disease or distorted by the presence of complicating factors. In mastoid surgery one occasionally meets with the most extensive pathologic changes notwithstanding the fact that the clinical symptoms did not appear alarming.

Atypical cases of mastoiditis, while sometimes extremely difficult to recognize, may at the same time lead to serious results when operation is not performed. This fact is emphasized by the unexpected finding at operation of dangerous lesions in close proximity to such vital structures as the latera sinus, the middle fossa of the skull, or the semicircular canals.

The symptomatology of unresolving mastoiditis is dependent upon certain underlying pathology, which, for the most part, results from insufficient drainage; other factors to be considered are the virulence of the infecting organism, the bony structure of the mastoid process, and the degree of the patient's resistance. Because of the presence of a mixed infection, it is often impossible to demonstrate the true offending organism. The staphylococcus alone may show in the aural discharge, while the more virulent bacteria, for example the streptococcus or the pneumococcus, remain in the mastoid antrum and the deeper cells.

In order to properly evaluate the trend of events in the atypical case, it might be well to review the classical symptoms of the disease and to consider the unusual manifestations in this order. I

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shall, therefore, discuss this subject under the following headings:

1. Pre-existent Otitis Media; 2. Pain; 3. Mastoid Tenderness; 4. Fever and Leucocytosis; 5. Swelling and Edema Over the Mastoid; 6. Prolapse of the Posterosuperior Wall of the Auditory Canal; 7. Deafness; 8. X-ray Findings.

1. *Pre-existent Otitis Media.* Acute purulent inflammation of the mastoid cells is usually secondary to an acute or chronic suppurative otitis media. As the mucous membrane lining the mastoid antrum is continuous with that of the middle ear, there is some concomitant inflammatory reaction in almost every case of acute infection of the tympanic cavity. However, less than 2 per cent of such cases terminate in a true mastoiditis of such a nature as to demand surgical intervention.

In most cases of mastoiditis, the history of an antecedent otitis media is clearly established, and there usually is, or has been, an aural discharge through one or more perforations in the drumhead. In the atypical cases of mastoiditis, however, the history of middle ear disease may be entirely lacking, and there may be no discharge at any time and no perforations of the membrana tympani. In such cases, the tympanic phase of the disease is so insidious as to be overlooked or actually unrecognizable. Phillips and Friesner<sup>1</sup> in 1922 reported five cases of atypical mastoiditis in which the history showed no discharge from the middle ear and there were no spontaneous perforations of the drumhead. Case 3 of my series and one previously reported were also of this type. Hempstead<sup>2</sup> in 1923 stated that only fifty-two cases of mastoiditis without apparent involvement of the middle ear had been reported up to that time in the English and American literature. He reported three additional cases of his own. Two more cases were reported by Heggie and Knauer<sup>3</sup> in 1924. There are numerous observations, therefore, to demonstrate that one of the important forms of atypical mastoiditis is that which occurs without any apparent preceding otitis media.

Absence of pus in the middle ear with a closed drumhead can be explained by there having been a previous infection in the tympanic cavity by way of Eustachian tube. After the bacterial process has extended into the antrum, or mastoid cells, the infection in the middle ear becomes quiescent. A walling off of either antrum, middle ear, or both, takes place, while the bacterial invasion still continues in the smaller cellular spaces.

2. *Pain.* Of the symptoms which characterize the typical case of mastoiditis, the most important one is pain. A deep-seated post-auricular pain, persisting after otorrhea has been established, is

strongly suggestive of mastoid disease. The pain may be in the nature of a dull ache, or of the lancinating variety, radiating over the entire side of the cranium.

Pain is the most constant of all the symptoms of mastoiditis, being present in the great majority even of the atypical cases. However, Politzer<sup>4</sup> some years ago called attention to the fact that in exceptional cases pain and tenderness may be entirely wanting, even in the presence of extensive abscess formation. Hays<sup>5</sup> in 1922 reported a case in a child, age 4 years, following scarlet fever, in which there was no pain at any time, although operation disclosed the presence of a large quantity of pus in the mastoid process, together with a perisinuous and epidural abscess. Another unusual case in which there was no pain, discomfort, or fever, either before or after operation, notwithstanding the presence of extensive and total infection of the right mastoid process, including a perisinuous and epidural abscess and lateral sinus thrombosis, was reported by Jones<sup>6</sup> in 1923.

I have previously reported the case<sup>7</sup> of a girl, age 9 years, who at no time following a myringotomy complained of any pain. One the fourth day she experienced a chill, followed by a rise of temperature to 104.° I advised an immediate operation, which disclosed a mastoid tip filled with pus and extensive necrosis of the cells over the lateral sinus.

3. *Mastoid Tenderness.* The great majority of patients with otitis media have some degree of tenderness over the mastoid process during the first week of their illness. When such tenderness persists throughout the second week or, if previously absent, appears at that time, it furnishes presumptive evidence of the presence of inflammation in the mastoid.

Mastoid tenderness in the presence of infection is, to a large extent, conditioned by the osseous structure of the mastoid process. The infected mastoid, which has a thin cortex and is largely of the pneumatic type, is always quite sensitive to pressure. In the sclerotic type of mastoid, which contains but few pneumatic cells, there may be no tenderness even on firm pressure, notwithstanding the presence of advanced disease within the bone. The same state of affairs is true when the external cortical layer of the bone is abnormally thick. Thus the absence of tenderness by no means rules out mastoiditis. Hays<sup>8</sup> in 1923 reported three cases in which, in spite of the absence of tenderness over the mastoid, advanced suppuration and bone destruction were found at operation.

In my third case, there was an entire absence of tenderness over the mastoid or in its vicinity; in the first case, pain was felt by



making pressure over the sternocleidomastoid muscle, but not over the mastoid process itself.

4. *Fever and Leucocytosis.* Slight fever with associated leucocytosis is the rule in uncomplicated mastoiditis; but fever is one of the most unreliable symptoms. There may be very extensive involvement of the mastoid without any elevation of the temperature. In case of complicating brain abscess, the temperature may even be subnormal. Two of the three cases of atypical mastoiditis which I am reporting were characterized by an afebrile course.

5. *Swelling and Edema Over the Mastoid.* The presence of edema over the mastoid process is very significant; unfortunately, however, this sign is noted only in subjects with a thin outer cortical wall. Swelling and edema over the mastoid are not to be expected in the atypical case. These changes were not observed in any one of my three cases.

6. *Sagging of the Posterosuperior Wall of the Auditory Canal.* This sign, which is usually associated with a bulging of the posterosuperior portion of the drum membrane, is of great diagnostic importance when present. It results in a distinct narrowing of the auditory canal and is caused by a retention of pus in the mastoid antrum and border cells. This sign was absent in the cases under discussion. In atypical cases of mastoiditis, sagging of the posterosuperior wall may be absent. On the other hand, this sign may be noted in furunculosis of the auditory canal.

7. *Deafness.* Impairment of hearing is apt to be greater in the atypical than in the typical case. MacKenzie,<sup>9</sup> who recently called attention to this fact, gives as the reason the frequent involvement of the perceptive apparatus in the inner ear as well as of the conductive apparatus in the atypical cases of mastoiditis. The typical case is usually recognized early, and a prompt operation protects the bone from extensive damage. In the atypical case, however, the infection is often allowed to spread to the sound-perceiving apparatus before surgical intervention is instituted.

8. *X-ray Findings.* In the frank case of suppuration of the mastoid, the X-ray findings are very definite. The density of the bone is increased, and the trabeculae which outline the spaces are blurred.

In the recognition of the atypical case of mastoiditis the X-ray is of great value. The three cases which I am reporting offer convincing evidence of the importance of this procedure in the suspected case. Even when the clinical signs are clearly defined, a Roentgenogram should, nevertheless, be taken in order that one may know beforehand the anatomic structure of the particular

mastoid with which he is dealing, the probable extent of the destructive process, and the position of the lateral sinus. The sclerosed or acellular mastoid is the type most frequently encountered in the atypical case. One can be forewarned of the presence of this condition by an X-ray picture. In the diploetic mastoid, with sparse evidence of pneumatic cells, the antrum is likely to be deeply placed, with very thin bone separating it from the most vital contiguous structures, such as inner ear, the middle or the posterior cranial fossa.

In studying the X-ray appearances of the mastoid, Bigelow and Gerber<sup>10</sup> have emphasized the fact that various films may show every possible gradation, ranging from the completely acellular mastoid to the most widespread pneumatization. Their studies show that Roentgenologically there is no such thing as a "typical" mastoid process.

#### REPORT OF CASES.

*Case 1:* A man, age 35 years, was referred to me on Oct. 14, 1923, with the complaint of constant pain in the right ear. He had had an attack of what appeared to be influenza in March, which resulted in a chronic nasal discharge. In August, he began to have pain in the left ear, and the drumhead ruptured. There was discharge from the ear for two weeks, after which this ear gave him no further trouble.

The present illness began early in September with almost constant pain, which was described as being located deep in the right ear. When I first saw the patient on Oct. 14, the tympanum of right ear was retracted and thickened and the cone of light diminished. There was also some retraction of the left drumhead with adhesions.

His nasal septum showed marked deviation to the left. On the right side, there was some pus at the anterior end of the right middle turbinate. Pus was also found in the sphenoethmoidal recess of the same side. By washing the right antrum, one-half ounce of a serosanguineous discharge was obtained.

The right external auditory canal was slightly swollen, and there was some inflammation of the external ear. The latter condition subsided in two days under local treatment, but the pain continued. Drainage of the right antrum and sphenoethmoidal region gave no relief. On account of the subacute inflammatory thickening of Shrapnell's membrane, an incision was made in the right eardrum; but there was no purulent discharge, only a slight amount of blood.

*X-ray Findings:* Roentgen ray examination of the mastoid processes disclosed evidence of a low grade of change in both bones.

The cells were well developed and of the pneumatic type, but the pictures showed loss of definition and increased density in the immediate neighborhood of the canal.

X-ray examination of the accessory sinuses showed a noticeable increase in the density of the right antrum which, however, was not evenly distributed throughout the sinus; it probably did not represent fluid. There was some increase in the density of the right ethmoid and sphenoid sinuses.

*Further Course.* There was no fever at this time. A latent mastoid abscess on the right side was suspected, and an exploratory operation advised. However, the patient was obliged to return home and was not seen again until Nov. 16. He then stated that three days after his return home his right ear began to discharge.

The patient's chief complaint, when he was seen in November, was a deep-seated pain, located about 1 inch below the tip of the mastoid. There was no tenderness over the mastoid antrum or tip. However, the patient manifested severe pain when pressure was made along the anterior border of the right sternocleidomastoid muscle. Through a small perforation there was seen coming from the right tympanic cavity a slight amount of purulent discharge. Culture of the pus showed staphylococcus. There was some bulging of the drumhead in the neighborhood of Shrapnell's membrane. Hearing of the whispered voice had diminished from 8 feet to 4 feet. The temperature was normal and the white blood cell count was 8,000, with 86 per cent polynuclears.

X-ray examination at this time gave an appearance somewhat similar to that of a month before, except that on the right side there was a slight increase in the haziness with still greater loss of the definition of the pneumatic cells. The appearance was such as to suggest some degree of disturbance in both processes.

*Operative Findings:* A diagnosis of mastoiditis was made and mastoidectomy was performed on the right side. The cortex overlying the region of the antrum was found to be quite dense. Pus and granulations were found in the antrum. Exploration of the mastoid tip disclosed a large amount of granulation tissue with free pus under pressure. The lateral sinus was covered with a large necrotic mass. In removing these granulations, the lateral sinus wall was accidentally perforated. There was free bleeding from both ends of sinus. The lateral sinus and mastoid cavity were taken care of in the usual manner. The patient made a good recovery and was discharged on Dec. 9 with the wound perfectly healed.

*Case 2:* A woman, age 63 years, was referred to me on Jan. 5, 1924, with a history of frequent attacks of pain over the right temporal region which began about the middle of December, 1923. She had suffered from a brief attack of purulent otitis media in the same ear during the previous October. This attack subsided following a spontaneous rupture of the eardrum and the resultant aural discharge ceased after three days. At times, however, the patient said she suffered from attacks of vertigo, during which she felt an inclination to fall forward. On Dec. 15, her discomfort returned and the drum membrane was lanced by her physician. This procedure afforded only temporary relief.

Examination on admission disclosed a small amount of discharge from the right middle ear and slight edema of the auditory canal. There was no definite sagging of the posterosuperior wall. Mastoid tenderness could be elicited by firm pressure over the tip only. The temperature was normal and the white blood cell count was only 6,500, with 70 per cent polynuclears. Culture of aural pus showed staphylococcus. At time of operation, however, the microorganism in the deeper cells proved to be the pneumococcus.

*X-ray Findings:* Roentgen ray examination showed evidence of a chronic destructive disease in the right mastoid process, with partial eburnation. In the upper posterior and lower portion, the cells were preserved, but had the characteristic appearance of infected bone.

*Operative Findings:* A simple mastoidectomy was done. The cortex was found to be extremely dense. Free pus was found in the upper and posterior mastoid cells. The tip of the mastoid was filled with pus and necrotic tissue. There was very little pathology in the mastoid antrum. Further exploration revealed the presence of a perisinuous abscess. The wound was closed with drainage and healed satisfactorily. The patient made a good recovery.

*Case 3:* A girl, age 7 years, was seen in consultation, Mar. 20, 1924, and admitted to hospital, Apr. 12, 1924. The chief complaint was an intermittent pain over the left mastoid region of six weeks' duration, which followed an attack of measles. The patient's eardrum was incised when first seen and also two weeks later, but at no time was there any discharge from the middle ear.

Repeated examination revealed no evidence of mastoid tenderness. The temperature range was between 98.8° and 99.5° F. The white blood cell count was 12,500, with 75 per cent polynuclears.

*X-ray Findings:* Roentgen ray examination disclosed definite evidence of involvement of the left mastoid bone. The whole

mastoid region was blurred as compared with the right side, and the definition of the cell outlines was lost.

*Operative Findings:* The diagnosis of acute mastoiditis was made and a simple mastoidectomy was accordingly performed. The mastoid antrum was found to be filled with granulations which were walled off from the remaining portions of the mastoid by fairly dense bone. Pus was found beneath the tip, pointing posteriorly in the direction of the lateral sinus, also above and toward the middle fossa of the skull. Following the operation the child made a good recovery.

#### SUMMARY.

1. In mastoid surgery the most extensive pathologic changes are sometimes encountered in cases without alarming clinical symptoms.
2. One must constantly be on the lookout for the atypical case of mastoiditis; otherwise, there will be danger of the development of dangerous complications before the condition is recognized.
3. There are many observations on record to prove that mastoiditis may occur without any apparent preceding otitis media.
4. Pain is the most trustworthy of the symptoms of mastoid suppuration, but even this evidence may be altogether lacking in atypical cases.
5. In atypical cases there may be no tenderness even on firm pressure over the mastoid process, notwithstanding the presence of advanced disease within the bone. The sclerosed type of mastoid with but few pneumatic cells and the mastoid with a very thick external cortical layer are the types which are likely to be free from tenderness.
6. Fever, leucocytosis and edema over the mastoid are ordinarily absent in atypical cases.
7. Sagging of the posterosuperior wall of the auditory canal is an important sign of mastoiditis, when present, but this sign may be wanting.
8. Deafness is apt to be more pronounced in the atypical than in the typical case of mastoiditis.
9. The X-ray findings are of great assistance in the suspected case of mastoiditis. In each of my three atypical cases, the Roentgenogram was of decisive importance in the diagnosis. An X-ray picture of the mastoid processes should be taken even in the frank case of suppuration, in order that one may know before operation the anatomic structure of the particular mastoid with which he is dealing, the probable extent of the destructive process, and the position of the lateral sinus.

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Suite 611, Heard Building.

## MIDDLE EAR ABSCESS.

DR. M. M. CULLOM, Nashville, Tenn.

Mr. A., white, male, age 29 years, gives the following history: The week of March 1 was not feeling well. On Sunday, March 6, had pain in right ear. On Tuesday, right ear began to discharge and pain in ear stopped. Patient continued to feel ill and ear continued to discharge. Consulted me on Saturday, March 13.

Patient pale and ill looking. Discharge from right ear. After cleansing ear, a small perforation found in drum membrane. Patient has a unilateral purulent discharge from right nostril, causing excoriation of skin. Transillumination shows right antrum dark.

This case is reported to illustrate a group of cases that I have observed for the past six years, namely, middle ear abscess following empyema of the antrum on the same side as the ear involved.

I would say, roughly, that 85 per cent of my mastoid cases coming to operation during the last six years have shown an infected antrum on the same side as the mastoid involved. There is nothing mysterious about this. The only thing surprising is, that all patients with antral empyema do not develop abscess of the middle ear, as the pus draining downward runs over the orifice of the Eustachian tube, and infection easily follows.

It is the same mechanics that gives patients a middle ear abscess following irrigation of the nose.

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## THE UNNECESSITY OF MYRINGOTOMY IN ACUTE MIDDLE EAR INFLAMMATIONS.

DR. CHARLES GLUCK, New York City.

That it is no longer necessary to rush in pell-mell and puncture or cut open the eardrum in acute cases of catarrhal or purulent inflammation of the middle ear is a foregone conclusion. That we are capable of quickly relieving the severe pains of the ear and side of the head that patients, afflicted with acute or subacute inflammation of the middle ear complain of, is no longer necessary of proof. All this, today, is a scientific fact capable of mathematical proof, allowing itself to be demonstrated in all cases.

It has been known for many years that infection of the middle ear takes place as a result of infective agents entering it through the Eustachian tube from the nose and throat. Exceptions to this rule are extremely rare. The fact that we are capable of quickly and easily controlling and destroying most of this nose and throat infection is not so clearly understood and generally known. This is due to the simple fact that it is not clear in the minds of all in just what parts of the nose and throat this infection is to be found, and, likewise, how easily it can be made harmless and removed. The infective material which gives rise to inflammation of the middle ear arises from any part of the nose and throat, that is, from any of the subdivisions of Waldeyer's ring, such as the faucial tonsils, from the adenoid tissues or their adhesion band remains, from the different sections of the nasal septum, from any part of the turbinal entity, or from the paranasal sinuses, or from pyorrheal teeth. Of all the above mentioned structures there are two that require especial mention. The first is the faucial tonsils. The crypts and crevices of the faucial tonsils require careful cleansing attention in every acute ear case. The second highly important area from which this infective material is derived, and its immediately surrounding structures, is the sphenoethmoidal recess. This recess apparently appears to be a cesspool of the human body. It can, however, be thoroughly and carefully cleansed, as will be shown.

Given any case of acute, painful, middle ear infection, with red bulging or nonbulging drum, which drum has not yet perforated or has already perforated, patient weak, more or less prostrated, and



if a thorough antisepticizing nose and throat treatment (such as the writer uses and to be described presently), is administered, the acute, severe ear pains will almost instantly commence to disappear, the congestion of the middle ear structures begin to lessen and the fever to abate. These statements are equally true of infant, child or adult. This antisepticizing nose and throat treatment should be administered every two or three hours in severe or very acute cases; in the milder type of cases, once daily. In the average case the drum will not go on to perforation. If perforation of the drum does take place, as rarely happens, or has already taken place, the discharge will quickly commence to decrease and will disappear in a few days to one or two weeks.

The pleasantest thought in connection with this method of treating painful middle ear inflammations is the fact that it is the best sleep-inducer or soporific that the writer has had the pleasure to know of, and employ in all his experience in the field of medicine. A crying, restless, fretful infant with painful, red, bulging drum receives one of these nose and throat antisepticizing treatments in a careful, gentle manner. Within a few minutes the infant, who has been unable to sleep for a number of days or more, falls asleep and sleeps soundly all night. The same is equally true of a child or adult. No narcotic or other pain-relieving agent can compare with this method.

Right here, an extremely important diagnostic point possessing great differential value must be mentioned. It can be accepted practically as a fact that if the ear or mastoid process only are involved by the inflammatory process we can depend on the "sterilans magna" treatment advocated by the writer to relieve all pains and aches caused by this acute inflammatory process in the ear or mastoid structures, and if any severe pains, headaches or aches persist for more than forty-eight hours after the institution of the frequent nose and throat antisepticizing treatments we may safely assume and conclude that we are already dealing with complications. These complications may range anywhere from extradural abscesses to cerebella or temporosphenoidal brain abscess, or other complications or involvements.

In cases that were an acute attack on an old chronic purulent otitis media we must not expect the discharge to disappear entirely, in as short a period of time as it will in the simple, acute types of cases. However, if these antisepticizing nose and throat treatments are continued long enough and followed by the reconstruction work recommended by the writer in his article which appeared in the *Eye, Ear,*

*Nose and Throat Monthly*, of March, 1925, the worker will have the satisfaction of observing the discharge disappearing even in these chronic purulent cases, simultaneously with the disappearance of the ill smelling odor, and a great improvement in hearing; and general improvement in the patient's well-being and strength will result.

Just how the quick control or destruction of this infective nose and throat material is capable of alleviating and even completely stopping earaches and pains is as yet not clearly understood. That possibly, ear infections are a continuously repeated process of invasion and infection of the middle ear by infective material progressing by way of the Eustachian tube, is apparently the only plausible explanation when attempting to explain this phenomenon of the rapid results obtained by such treatments.

*The Writer's Antisepticing Method of Treatment for the Control of the Acute Middle Ear:* In the last ten years or more I have uniformly treated all acute ears according to one set formula. This included quite a few thousand cases of all types and grades of severity of the acute middle ear of both the catarrhal and purulent forms; and amongst these cases were quite a few with incipient mastoiditis and also many that were fairly advanced cases of acute mastoid inflammation. For that matter every acute middle ear is a potential mastoid case, with all the possible complications that may follow in the wake of an acute ear.

To accomplish these results I have used principally one solution. This consisted of the bichlorid of mercury solution, varying in strengths from 1-1000 to 1-5000. I proceed in the following manner: Both nasal fossae are first sprayed with a mild anesthetic solution. The entire nasal cavity is then gently and carefully swabbed with a similar mild anesthetic solution, using the cotton-tipped applicator. Any mucus, pus or dried secretions found anywhere in the nasal fossae are removed by cotton-tipped applicators, forceps and aspiration. Thus the entire nose and throat area is thoroughly cleansed with the aid of suction. This is immediately followed by a careful, gentle swabbing with a 1-1000 bichlorid of mercury solution. The entire nasal cavity (both nasal fossae) are then thoroughly and repeatedly sprayed with a 1-3000 bichlorid of mercury solution, using preferably the No. 56 DeVilbiss one hole spray-tip, since this tip, due to its smallness, lends itself to facile insertion into the various small cavities and areas, and can be carried back as far as the vault of the pharynx through the nose. It can readily be inserted into the crypts of the tonsils after thoroughly treating the nasal fossae and the epipharynx. The second step—the entire pharynx is gone over with

this same spray, not forgetting to insert it into the tonsillar crypts and washing them out thoroughly. All the rest of the surrounding lymphoid tissues of Waldeyer's ring is likewise carefully cleansed and antiseptized, giving particular attention, in the case of adults and especially elderly people, to the lingual tonsils, in whom such structures will almost invariably be found. The patient is cautioned to blow out and expectorate the excess solution, advising him against swallowing any. Too much force is not to be used in blowing the nose, and one side of the nose is blown at a time. In children and infants the tonsil suction apparatus is used to carry off the excess when treating the throat. The small quantity used to spray the nasal fossae is left there, and need occasion no worry since the amount is too small to be toxic.

In adults, especially in those cases wherein there is a profuse nasal mucus or mucopurulent discharge the suction apparatus is applied to the anterior nares, and by means of the aid of vacuum the accessory sinuses are emptied of as much accumulated mucus or pus as possible. The suction apparatus need not be used in every case, or every treatment, but only in those cases with profuse nasal discharge. The cleansing and spraying is ordinarily sufficient.

Of paramount importance, in this connection, while treating the nasal fossae are the sphenoethmoidal recesses. The more the writer goes into this matter the more is he convinced that the structures and the condition of the structures to be found in and in the neighborhood of the sphenoethmoidal recess are to be blamed for more of man's troubles than is generally known. These recesses must be handled with the greatest of gentleness. The ostia of the sphenoids and posterior ethmoids open into it. After shrinking of the turbinates and mucous membrane of the septum by means of the anesthetic spray and adrenalin, we can almost always insert the tip of the spray (DeVilbiss No. 56, one hole) into this recess. We must be very careful, however, not to insert it too far back, that is, into the openings of the sphenoids, as this is not necessary in the average case and should only be done with the greatest of caution and with very little air pressure.

This entire treatment is repeated anywhere from one to four times daily, depending on the severity of the symptoms of the individual case; one treatment daily is sufficient in the mild cases. By this method, with extremely few exceptions, the acute ear of either the purulent or catarrhal type can be controlled by the second or third day. The patient will rest comfortably the same night of the first treatment and most probably will be enabled to sleep. The ex-

cruciating pains will almost immediately commence to disappear after the first treatment. This is likewise true of tenderness over the mastoid process or mastoid tip in patients who have a beginning mastoid involvement or any of the other pains so frequently experienced by these early mastoid patients, such as pains around the lower jaw, side of the head, throbbing pains around the ear, etc. That is, almost invariably, the acute pains present in the simple, acute purulent or catarrhal middle ear inflammation and the acute pain, tenderness, swelling and edema over the mastoids in cases where the mastoid already showed signs of involvement would immediately commence to subside. It will be found unnecessary to open the drum in these acute or subacute cases, since we find that the pains are quickly relieved, and the bulging of the drum subsides rapidly.

*Illustrative cases: Case 1:* Child, age 8 months; for past two weeks has been very irritable, crying constantly, restless, unable to sleep. Examination disclosed both drums extremely red, bulging, congested, markedly inflamed. Writer administered one of his nose and throat antisepticizing treatments and all symptoms disappeared in a very short time. Infant was able to sleep all night after the first treatment; and mother stated that she was also enabled to sleep undisturbed.

*Case 2:* Man, age 62 years; several weeks previous to consulting the writer, patient was taken with an acute, painful attack of purulent otitis media. Attending physician did a paracentesis. Symptoms did not disappear. There remained decided deafness and very annoying, persistent, loud, hammering noise in this ear. Patient was then treated as suggested by writer, with excellent return of hearing and disappearance of most of his hammering noise. A few weeks later patient returned with an acute inflammatory condition of the other ear. A few nose and throat antisepticizing treatments and all pains and discomforts of this ear were relieved with gradual return of hearing to the acuteness of the watch-tick. What made this case unusually difficult was the fact that this patient was afflicted with an old, filthy type of atrophic rhinitis. However, this made no difference in the ultimate satisfactory results, as far as the nonparacentesed ear was concerned. But the paracentesed ear, however, did not return to normal as readily as the other ear, which had not been incised. There was a much greater degree of obstinacy as regards return of good hearing and disappearance of all head noises.

*Case 3:* M. M., age 21 years; previous history negative. Present history, acutely ill for three days, with extremely severe pains of right ear. Marked pain and tenderness and some swelling and edema over right mastoid process. Patient placed on Dover's and aspirin and routine treatment instituted. Temperature dropped in twenty-four hours from  $103\frac{1}{2}^{\circ}$  to  $101^{\circ}$ . Mastoid pain, tenderness, swelling and earaches all quickly disappeared in next forty-eight hours. A paralysis of the (right) entire half of the face appeared on the fourth day (Bell's palsy). Under the continuous nose and throat antisepticizing treatment this facial paralysis disappeared with all other symptoms in the next two or three weeks. Hearing normal. Tonsils enucleated a month later. Patient advised to have septal deflection corrected in the near future; and also a readjustment or resetting of all the turbinate bodies (turbinal entity), that is, all other nasal corrections necessary in accordance with the writer's rule likewise to be carried out. This was published in the November edition of the Clinics of North America, 1925, p. 735.

*Case 4:* Mrs. J. M., age 37 years, mother of five children; past history, suffering for years with eczematouskeratoconjunctivitis, numerous phlyectynules covering both cornea. Likewise afflicted with chronic blepharitis of both eyelids of each eye. Patient treated routinely as outlined, and operated by writer six years ago for complete tonsil removal, and complete submucous resection of nasal septum. Patient improved rapidly, phlyectynules disappeared, eyes cleared up completely. Patient disappeared from observation for six years or more. Returned in March of 1925, complaining of pain over right mastoid and pus discharging from right ear, watch-tick not heard on this ear, whispered voice heard at  $1\frac{1}{2}$  feet only. Writer removed large dangling polypi from underneath left middle turbinate (left anterior ethmoidal sinusitis and double sphenoidal sinusitis confirmed by X-ray). Patient went home and disappeared from treatment for two days, when writer was hurriedly called, and found patient flat on back, unable to raise her head, and suffering with all the acute symptoms of an attack of serous labyrinthitis, such as extreme tinnitus, vomiting on elevation of the head, a marked right horizontal nystagmus on directing patient to look to left, and continual sensation of room and all objects in it constantly turning around. Patient extremely dizzy on slightest motion. Marked pain, tenderness and swelling present over right mastoid. Patient placed on Dover's and aspirin and nose and throat treated routinely, twice daily. Right ear also cleansed with same spray solution, and canal filled with bichlorid of mercury solution (1-2000). All symptoms

rapidly commenced to ameliorate, and under the continued use of the writer's simple nose and throat antisepticizing treatment the patient was up and about and all symptoms, including pain, tenderness and swelling over mastoid process, had disappeared by end of fourth week. Hearing normal to all tests.

The acutely inflamed middle ear which is treated by the method advised by the writer will heal quicker, with less destruction and injury to the delicate structures and lining membranes, and with less sequelae, such as tinnitus or deafness, than the ear which is treated according to the old-fashioned method of eardrum incision. Of chief importance, it is to be remembered that we can expect less head noises, and a sooner complete disappearance of all head noises and deafness; and we must remember that we need not worry about the return of hearing as this will invariably take place to the same amount that existed previous to the acute attack or better.

*Summary:* Paracentesis, cutting or puncturing of the eardrum is unnecessary in view of the fact that simple nose and throat antisepticizing treatment will almost immediately control the acute symptoms, the pains, etc., and quickly restore the drum and hearing to normal, prevent perforation of the drum in most cases, make the discharge disappear completely, close all recent drum perforations, should any take place, and rid the patient of any head noises, or tinnitus he may have had during the acute attack.

666 Madison Avenue.

## SUCCESSFUL TREATMENT OF CHRONIC DISCHARGING EARS AND ALLIED CONDITIONS BY MEANS OF ZINC IONIZATION.

DR. JOHN MCCOY, New York City.

My object in presenting this paper before you this evening is to give my results and conclusions after using the method of zinc ionization during the past year. It was first practiced by Dr. Le Duc, of France, and later on extensively used by Dr. Friel, of England.

If we review briefly what takes place when zinc ionization is practiced we will find that ionization is a chemical decomposition effected by means of an electric current. There are certain laws governing this decomposition. Ions are groups of atoms which result from the electrolytic decomposition of a molecule. These ions are either electronegative or electropositive. The electronegative ions are called anions. Electropositive ions are called cations. Hydrogen and the metals generally are cations. The electropositive ions, or cations, tend to flow toward the negative pole. It has been found that by the use of a solution of sulphate of zinc at the positive pole and the ordinary saline solution at the negative pole it is possible to drive the zinc ions into the exudate and into the membranes of the ear cavities. Some have gone so far as to claim that such a procedure will cure chronic necrosing mastoiditis. Our observations have not borne this out. They have proved to us, however, that this method will cure many cases which are generally regarded, from their symptoms, as being chronic middle ear and mastoid necrosis.

In cases where there exists a marginal perforation in Shrapnell's membrane with bone necrosis and foul smelling pus, this method should not be used. It has proved exceedingly useful, however, in cases of subacute and chronic discharge where the perforation is central or near the margin and where numerous other methods used for chronic suppuration have failed. Before resorting to its use we believe that symptoms of extension to structures adjacent to the middle ear and mastoid should be ruled out as far as possible by means of X-ray pictures of the mastoid and by careful examination of the labyrinth, etc. The X-ray is taken to exclude cavitation and sequestrum.

Zinc ionization is practiced in the following way: The ear is thoroughly cleansed with warm water. A pledget of cotton contain-

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ing 4 per cent cocain solution is then applied to the middle ear for a period of 5 to 10 minutes. The patient is then placed upon a table with the diseased ear upward. After the pledget of cotton has been removed from the ear, the ear is filled with a 1 or 2 per cent zinc sulphate solution and the zinc electrode attached to the positive pole is placed in the ear through a vulcanite speculum so that the zinc electrode and the zinc sulphate solution are in contact. The patient is then given the other pole to hold in the hand, or it is applied to the arm, being very wet with a saline solution. The current is then turned on very gradually until a strength of 3 m.a. is reached. This is allowed to continue for 10 minutes, when the current is very gradually turned off. Unpleasant effects sometimes take place in the shape of slight dizziness or slight pain in the region of the Eustachian tube, but they are very evanescent. By this method the writer has treated eighteen cases with results that were surprisingly gratifying, the patient's ear condition drying up in from two to six treatments, the treatments being administered once every four or five days. An abbreviated report of the cases treated is as follows:

In all the chronic cases the X-ray showed sclerosis of the mastoid with obliteration of the cells. In one subacute case the mastoid was of the infantile type.

Mr. B., age 26 years, pus discharge from left ear fourteen years. He had a large central perforation of the drum and was advised to have a radical mastoid operation. The ear became dry after six treatments.

Mr. R. H., age 35 years, pus discharge and very foul smelling odor from the left ear thirty years. The ear became dry after seven treatments.

Miss C., age 29 years, had a radical mastoid operation performed, which healed except in the portion of the wound located in the lower part of the mastoid process. She continued to throw out a discharge from there for two months. Cavity dry after three treatments.

Mrs. Van S., age 29 years, discharge from right ear for three months through a small central perforation of the drum. Ear became dry after the third treatment.

Mrs. P., age 31 years, five weeks following simple mastoid operation for mastoiditis and serous labyrinthitis the ear suddenly filled with discharge and she had a return of labyrinth irritation symptoms. Her ear became dry in four treatments.

Mrs. P. H. P., discharge for two months from small central perforation. The ear was dry after one treatment.

Mr. K., age 33 years, five years after a radical mastoid operation he commenced to have discharge from the radical cavity and this persisted for five months. His ear became dry after two treatments.

Miss L., age 35 years, four months after a simple mastoid operation had healed, the ear began to discharge. This cleared up in two treatments.

Mr. I. N., age 22 years, pus discharge from right ear since childhood. Large central perforation. The ear became dry after one treatment.

Mr. A. McG., age 35 years. This patient had cholesteatoma with lateral headache and was advised to have operation. He could not have an operation at the time and preferred to take any form of local treatment. He was given six treatments with the result of making the discharge much less, and later had a radical mastoid operation.

Mr. Frank E., age 16 years, pus discharge from the left ear for three years. He was given six treatments with no improvement.

Dr. G., age 24 years, discharge from both ears twenty years. He was given seven treatments with no result.

Mrs. S., age 35 years, pus discharge from left ear for several months. The ear became dry after two treatments.

Three other cases took one treatment each and did not reappear.

The question naturally arises as to how permanent are these cures. I believe that this depends upon the condition of the nose and throat. If there are chronic infectious processes there I think we might have recurrence, but if the nose and throat are without pathology I think we can conclude that these cures are permanent.

730 Fifth Avenue.

## RADIUM IN DISEASES OF THE EYE, EAR, NOSE AND THROAT.\*

DR. LAWRENCE A. POMEROY and DR. ABRAHAM STRAUSS,  
Cleveland, Ohio.

In this report we wish to review briefly the principal diseases of the eye, ear, nose and throat in which radium has been found of value, and to compare this method of treatment with other methods. We have not attempted to make this a statistical report, but have recorded our own impressions and the reasons for them.

We shall omit most details as to the exact dosage, screening, and other purely technical matters. However, we do wish to mention the four commonest methods of applying radium, namely, 1. screened tubes at a distance; 2. steel needles embedded in the growth; 3. emanation seeds embedded in the growth; 4. unscreened emanation tubes as a surface application. Whatever method of radium application is used we try to accomplish as much as possible at the first treatment. If a large dose has been used it is usually unwise to repeat the treatment for several months. Complete regression of the tumor after a single dose is the ideal for which we strive.

Tubes of radium element screened with different thicknesses of metal, usually silver and brass, and separated from the growth by rubber tubing, may be used in direct contact with the surface of the growth or at a distance of 2 or more centimeters. With this method of application the radium rays have to pass through some normal structures, the intact skin for instance, before reaching the growth. This is the reason for screening the radium and applying it at a distance; otherwise, the normal structures would receive so much radiation that they would probably be severely injured by a dose sufficient to act on the abnormal cells.

Steel needles containing radium element may be embedded directly into accessible growths and left in place for several hours or even, in some cases, for several days. These needles always have a thread or a wire attached, so that they may be removed at the expiration of the treatment.

Instead of using steel needles, minute capillary glass tubes containing radium emanation, which is the gas given off by radium, may be inserted in a similar manner directly into the tissue to be treated.

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In using these emanation seeds, there is this difference, however; the seeds are left in place indefinitely, either becoming surrounded by fibrous tissue or sloughing out if they are embedded in an infected area. It is possible to do this because the life of the radium emanation contained in these tubes is but a period of a few days, after which they become inert.

For the treatment of small areas of surface, longer glass tubes of emanation may be fastened to the end of a wooden tongue depressor with paraffin. If a sufficient quantity of radium emanation is used in these tubes, the treatment need not last more than 3 or 4 minutes. This method is suitable for superficial growths where a caustic effect is desired on the surface with no effect on the deeper structures. This method is particularly useful where it is desirable to avoid injury to periosteum or cartilage which is below a growth, while delivering an effective dose to the tumor itself.

*A. Eye.* I. Eyelids. 1. Epithelioma. 2. Angioma. 3. Vernal catarrh.

II. Eyeball. 1. Superficial epithelioma. 2. Cataract. 3. Pterygium.

III. Retrobulbar growths.

I. Eyelid. 1. A common tumor of the eyelid is the basal cell epithelioma. This can be efficiently treated by the application of screened or unscreened radium. The preferable method is the application of the unscreened tubes held in direct contact with the growth, at the end of a tongue depressor, one treatment of a few minutes usually being sufficient if the growth is not too large. The results are almost uniformly good in these cases unless the cartilage is involved. If this is involved, some form of electric cautery is usually necessary in addition to the radium application. Another danger is when one of these growths reaches and involves either of the canthi of the conjunctiva. In this location the growth may spread very rapidly and enucleation of the eyeball is often necessary.<sup>1</sup>

2. Angiomata of the eyelid usually respond promptly to radium applied to the surface of the tumor. Only a comparatively small dose is required as these growths are very sensitive to radiation.

3. Vernal catarrh, formerly a most obstinate disease, is very amenable to treatment with radium. The lids are exposed to the action of the active deposit of radium or to the unfiltered rays of the emanation for very small doses, or for a longer time to lightly screened radium.

II. Eyeball. 1. Small superficial epitheliomata involving the eyeball are best treated by surface applications of unscreened radium

according to the method already outlined for treatment of growths of the lids.

2. Much has been written about the treatment of cataract by radium. Our series is too small for statistical purposes, but we have found that the incipient cataracts can be partially destroyed or their progress checked. If the formation of a cataract has gone beyond this stage, radium has no effect on it. Well screened radium at a distance is the best method of application.

3. Radium has been recommended in the treatment of pterygium, surface application of a mildly caustic dose being recommended. From the nature of this growth this seems a very rational method of treatment, but we have had no personal experience.

III. Retrobulbar Growths. Retrobulbar angiomas and sarcomata usually respond promptly to screened radium applied at a distance, the radium usually being applied to the side of the face and anteriorly over the eye. The sarcomata are apt to recur, while the result is usually permanent in the angiomas.

*B. Ear.* Basal cell carcinomata of the external ear are treated in a manner similar to those of the eyelid, bearing in mind that cartilage does not stand radiation at all well. Eczema of the external auditory canal usually responds well to a screened tube of radium placed within the canal.

*C. Nose.* Epithelioma of the skin of the nose is subject to practically the same conditions as similar growths about the eyelids and external ear. In all these locations, excision of a small growth is possible and the results are usually good, but the cosmetic result is very much better with radium treatment.

Malignant neoplasms within the nose may be treated by embedding the growth with seeds of radium emanation, or if the growth has a pedicle and can be readily excised, this may be done and screened radium applied to the base of the pedicle to aid in averting recurrence.

Nasal polyps that recur may be removed again and screened radium applied to the base of the tumor. Radium thus applied lengthens the interval between the recurrences and more operative cures are obtained.

Nasopharyngeal fibromata are rather peculiar tumors. They are microscopically benign, but clinically malignant. They do not metastasize, but cause injury to neighboring structures by their direct spread. They are best treated by embedding emanation seeds, repeating the treatment five or six times at intervals of six or eight

weeks if necessary. This is the technic that has been used by New<sup>2</sup> at the Mayo Clinic.

Angiomata within the nose usually respond to the surface application of well screened tubes of radium.

*D. Mouth.* I. Lip. II. Cheek. III. Tongue and floor of mouth. IV. Tonsils. V. Pharynx. VI. Antrum. VII. Gums.

In treating all lesions about the mouth and throat, it is impossible to lay too much stress upon the effort to secure a clean mouth before starting the treatment of the new growth. In many cases it is necessary to extract numerous teeth, but the time spent on this portion of the treatment is well worth while, as there is much less inflammatory reaction when the radium can be inserted in a comparatively clean field. Some of our patients have refused to have badly diseased teeth extracted before having a cancer of the mouth treated, and have gone elsewhere for treatment.

In this connection, we should also like to emphasize the danger of a plastic operation after a malignant growth has received efficient treatment and is apparently quiescent. It is hard to give any definite rule, but we feel that in these cases a plastic operation for cosmetic results should certainly be delayed as long as possible. The danger of such an operation liberating cancer cells and causing a rapid recurrence of the tumor should be explained to the patient.

I. Lip. The local lesion in cancer of the lip may be treated by excision, it may be destroyed by some form of electric cautery, or it may be treated by radium or X-ray. In suitable cases any one of these methods gives good results. We feel that radium gives just as good results as any other method, and that it leaves less scar than excision or cautery destruction. These growths are usually treated by the surface application of lightly screened radium, but in some cases needles or seeds are embedded. However, the destruction or removal of the primary growth is but part of the problem and the cervical lymphatics should receive consideration in every case. If the glands draining the diseased area are not palpably enlarged, they may be treated by the X-ray and kept under careful observation. If the glands are enlarged, we feel that it is much safer to remove them by dissection, usually of both sides of the neck. If X-ray treatment is used instead of operation in these cases where the glands are definitely enlarged, the glands may continue to enlarge until it is too late to do anything by operation. We feel that an early operation on the glands gives the patient the best chance.

II. Cheek. Leukoplakia of the cheek is best treated by surface applications of unscreened radium. This method is very simple and

the results are usually good. These leukoplakiae are distinctly precancerous lesions and they should be treated thoroughly if at all.

Cancer of the inside of the cheek is a difficult disease to treat unless diagnosed very early in its course. Excision by the knife or by the cautery is mutilating, and the results are no better than with treatment by radium. In these cases we usually implant seeds of radium emanation. Small growths or small recurrent nodules near the periosteum may be treated by surface applications of unscreened radium.

III. Tongue. Cancer of the tongue is a disease that should be diagnosed early, but the diagnosis is usually made when the disease is rather far advanced. In the early cases, either surgery or radium implantations may be used with equally good results. Most of the cases that we have treated were rather far advanced where radium was used only for palliation. We feel that the same rules apply to the treatment of the cervical glands in these cases as to the glands in cases of cancer of the lip. In far advanced tongue cases where treatment is undertaken for palliation only, it is not worth while to treat the glands.

Cancer of the floor of the mouth is similar to cancer of the tongue except that surgical removal is rarely advisable. In these cases the prognosis is much less favorable than where the tongue alone is involved.

IV. Tonsils. A great deal has been written about treatment of enlarged tonsils by radium and the X-ray. While there is no doubt that either of these agents will cause hypertrophied tonsils to diminish in size and in many cases to disappear, we feel that practically all of these cases should be treated surgically. We are absolutely opposed to the use of radium in tonsils where there is any infection. If any small masses of lymphoid tissue remain after a tonsillectomy, it is easy to make them disappear by embedding a single seed of radium emanation in each one, or by the surface application of unscreened emanation for 2 or 3 minutes. Cancer of the tonsil is best treated by radium implantations, as operation and the cautery are absolutely contraindicated in this region because of the big blood vessels.

V. Pharynx. Malignant neoplasms of the pharynx are best treated by embedding emanation seeds in a manner similar to that used in the treatment of neoplasms of the tonsil. We have one case of small round cell sarcoma of the soft palate which is now well over six years after radium treatment.



VI. Antrum. Treatment of cancer involving the antrum is not very satisfactory by any method. Bloodgood<sup>3</sup> was unable to find in his records one proved case of carcinoma of the antrum cured by excision. The operative mortality is high and the operation is mutilating. We feel that the best results in these cases with involvement of the antrum are obtained by opening the antrum through the cheek or through the mouth, the usual procedure being to open through the mouth with the actual cautery. We believe that the growth should not be curetted, but that screened radium should be applied in the center of the antrum and X-ray applied, to the limit of the patient's tolerance, from the same side of the head, from the opposite side, and from in front.

VII. Gums. We have treated several cases of epulis with radium. This treatment must be severe enough to destroy the cells of the alveolar border and yet not intense enough to destroy the bone and cause a necrosis. When used properly, radium saves an operation and saves the teeth that would have to be drawn if the former surgical methods were used. We have inserted the steel needles containing radium in these lesions and find it the most satisfactory method.

*E. Larynx.* In recurring papillomata of the larynx in children good results are reported by New,<sup>4</sup> using the following technic: under ether anesthesia a screened tube of radium is held in contact with the growth, no attempt being made at operative removal.

In considering carcinoma of the larynx it should be remembered that the laryngeal cartilages form a barrier which resists for some time the spread of the growth, but that this barrier will not stand radiation at all well. We believe that in early intrinsic laryngeal carcinoma the best results are obtained by laryngectomy. In this connection it should be borne in mind that laryngectomy does not necessarily mean complete loss of the voice. In these intrinsic growths if operation is not performed, radium offers the next best method of treatment. However, extreme care must be used to avoid an overdose which will cause necrosis of the cartilage. In an occasional case, radium seeds may be embedded directly into the growth, but if radium is to be used in the small growths, the best method is to apply the unscreened emanation tubes or emanation in a glass bulb directly to the surface of the growth for two or three minutes. Freer has devised an apparatus which is useful in applying screened radium to the larynx or to the pharynx after the growth has been located by the ordinary laryngeal mirror. The apparatus devised by Haslinger and also that of Seiffert is of use in applying radium in some of these

cases. It is usually advisable to perform a tracheotomy before applying radium to the larynx, unless the patient is to be under close observation in a hospital for some time.

In extrinsic carcinoma of the larynx, we feel that the implantation of radium seeds is the best method of treatment, although palliation is all that can ordinarily be obtained.

*F. Esophagus.* The one encouraging fact about carcinoma of the esophagus is that the growth remains localized for a long time. While the tumor may spread by direct continuity, remote metastases are rare.

An accurate diagnosis is absolutely essential before undertaking the treatment of these cases. By accurate diagnosis we mean not only the diagnosis of the presence of a cancer in the esophagus, but its exact length, the size of the lumen and the contour of the growth as well as a study of the cellular structure of a specimen removed by biopsy. It is comparatively easy to locate the upper border of the tumor by esophagoscopy and by X-ray. It is almost equally important to have the same data concerning the lower border of the tumor. To secure some of this data it is necessary to perform a gastrostomy, and we are in favor of this procedure on this account and also because we believe that this in itself is good treatment for the growth and because it aids in the application of the radium. After a gastrostomy has been performed, the bismuth mixture may be inserted into the stomach and the patient examined by the X-ray with the feet higher than the head so that the opaque mixture gravitates into the esophagus. In many of these cases it is possible to do a retrograde esophagoscopy and get a view of the lower border of the tumor. Fielding Lewis<sup>5</sup> has described a method of measuring the length of the tumor by inserting the esophagoscope through the mouth, measuring the distance from the teeth to the growth, then, after the instrument has been removed, measuring this distance from the teeth to the skin of the chest and making a mark. The same procedure is performed through the gastrostomy opening, and the distance from the opening to the lower limit of the tumor is marked upon the skin of the chest. Thus the distance between these two marks gives the approximate length of the tumor.

After these data have been obtained, we are in a position to treat the patient to much better advantage. We believe that deep X-ray therapy plays a very important part in the treatment of these tumors, but we believe that small doses of radium are a definite aid in lessening the bleeding and discharge from the growth, and in aiding superficial healing. We have given up heavy and long continued

doses of radium. In certain of these growths, where the tumor is rather bulky and projects into the lumen, seeds of radium emanation may be inserted. Where the growth is destructive, we must remember that this is a dangerous procedure because of the extremely thin wall of the esophagus. In these growths screened radium can be applied, preferably by means of a tube attached to strings passed through the mouth and through the gastrostomy opening.

In conclusion, we wish to emphasize the need of co-operation between the radium therapist and the specialist in diseases of the eye, ear, nose and throat. It is impossible for the radium therapist to be an expert in every region of the body. It is only rarely possible for the specialist in these regions to be an expert in the application of radium and to know which method to use, and which to avoid on account of certain dangers or other limitations. In most of these cases the help of a specialist is absolutely essential in diagnosis. Need of co-operation is perhaps best illustrated by the difficulties that must be overcome in the treatment of cancer of the larynx and esophagus.

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503 Osborn Building.

607 Osborn Building.

## A FURTHER STUDY AND CLINICAL REPORT OF THE USE OF ACRIVIOLET IN DISEASES OF THE UPPER RESPIRATORY TRACT AND EAR.\*

DR. ARTHUR J. HERZIG, New York.

During the year 1912, Dr. John W. Churchman brought to our attention the bacteriostatic properties of gentian violet (Johns Hopkins laboratories).

The following year he published an article (in collaboration with Lucien Herz) showing the relative toxicity of gentian violet (Yale University laboratories).

He later on suggested the combination of acroflavine, which showed a predilection for the gram negative organisms (as compared with gram positive spore bearing acrobes), and gentian violet which favored the gram positive group. The combination of the above mentioned dyes is called acriviolet.

Dr. John W. Churchman in his discussion states: "The following characteristics of the dyes, which they seem to possess to a degree not shared in by the more commonly used antiseptics, are the ones which make us feel encouraged to hope that the dyes may prove of value in the treatment of infections, particularly surface infections, in the future. No dye nor any other antiseptic substance will kill bacteria which it does not reach, and it ought hardly to be necessary to say that the use of a dye in no way relieves one from the responsibility of applying to the treatment of an infected wound proper surgical principles.

1. The dyes are penetrative. This property may be readily demonstrated by experiments in animals, but I have also demonstrated it by observations in the living human being. In a patient who was to undergo a mid-thigh amputation the knee joint was injected, after anesthesia had been induced, with gentian violet. After the leg had been removed the synovial membrane was fixed and sectioned by a special technic, and one could see that the dye had penetrated through the surface cells to the subepithelial layers. The penetrative power was demonstrated still more strikingly in observations on patients undergoing colectomy. After the abdomen had been opened, a rubber tube was passed by an assistant, per rectum, high into the bowel,

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and through this tube gentian violet was injected into a loop of bowel isolated by the operator between ligatures. The isolated loop was thus distended with dye during the course of the operation, and immediately the colectomy was completed the distended loop was properly fixed and frozen sections made of it. It was found that the dye had penetrated through the thickness of the mucosa.

2. The dyes are strongly bacteriostatic. They are capable of killing organisms, but their power of inhibiting growth, even in rather high dilutions, is their most striking characteristic. This bacteriostatic power is selective, and the selective power is most sharply shown by gentian violet and other dyes of the same chemical series. These dyes, when added to the agar on which the organisms are planted, prevent the growth of many organisms and are without effect on the growth of many others. This selective power parallels very closely the gram reaction. Other dyes (of which acriflavine is an example) exhibit a selective activity which is in some respects the opposite of that of gentian violet, and the dye under discussion tonight is a combination of two dyes which have somewhat different affinities. It would appear to be slightly more effective than either component used alone.

3. The dyes have the power of preventing sporulation. If a little acid fuchsin is added to a suspension of a sporulating organism like *B. subtilis* in the vegetative stage no spores will form, though the bacteria are not killed. This is an interesting instance of selective bacteriostasis in which one function of an organism is paralyzed by a dye which does not seem to have much, if any, effect on the other functions.

4. The dyes are relatively nonirritating. Statements of this kind must always be qualified, and in the case of the dyes it must first be said that in the urethra and nose acriviolet, at least, must be used if, at all, with caution. But in general the dyes under discussion are, in strengths which strongly inhibit bacteria, without any noticeable harmful effects on tissue.

5. Evidence is at hand that the dyes are actually capable of causing bacteria to disappear from infected surfaces. Two years ago I had the opportunity of treating with dyes a woman suffering from acute gonorrheal cervicitis. She had had the tubes ligated two years previously, and we therefore had no fear that intrauterine injections would carry infection into the peritoneal cavity. The vagina, labia and urethral orifice were thoroughly painted with hot acriviolet, and the uterine cavity was distended with the dye through a silver catheter. Daily microscopical examination of vaginal smears

showed that the dyes caused prompt disappearance of all bacteria. These of course did not stay away, but when the dyes were stopped reappeared by reinfection through the vaginal orifice. The gonococci, however, did stay away permanently. It is not to be presumed that the result obtained in this peculiarly favorable case could be duplicated in the ordinary case of gonorrheal cervicitis, but the experiment did provide an opportunity to demonstrate in a living human being something of the bacteriostatic power of the dye.

These are some of the reasons why there is cause for hoping that the extensive study of the dyes now under way in laboratories and clinics will lead to an advance in the treatment of infection."

During the early spring of 1924, Dr. Joseph Abraham introduced the use of acriviolet, and advocated certain methods of applying same in diseases of the upper respiratory tract. His experiences with gentian and acriviolet at that time covered over four years, and were presented in a paper at the St. Louis meeting of the American Laryngological, Rhinological and Otological Society in 1924, and subsequently published in *THE LARYNGOSCOPE*, August, 1924.

Cultures have not been made in my cases; objective and subjective signs and symptoms were relied upon exclusively.

#### METHOD OF TREATMENT EMPLOYED.

The nose, postnasal space and pharynx are sprayed with a 2 per cent cocain solution. Naturally the larynx is also sprayed when it is desirable to treat same. Then cleanse parts to be treated with a 2 per cent sodium bicarbonate solution. Then the dye is applied or sprayed. The solutions used must be warm to obtain maximum results. The patient's clothes are protected with a rubber apron; the nares and lips coated with vaselin to avoid stains.

*Acute Rhinopharyngitis (Grippe Colds):* The pharyngeal post-nasal space and the nares are first sprayed with a 2 per cent solution of cocain (no adrenalin used). After this has taken affect, the post-nasal space is cleansed with a mild alkalin solution. Suction is then applied to the nares (utilizing in this way Bier's hyperemia). Then a spray or application of the dye is given postnasally and introrally, and into the larynx. This should clear up a cold in two to five treatments. Should this fail, we must look for complications such as ethmoiditis, or another sinus involvement, which should receive proper treatment. These patients are given a mild alkalin solution to use at home, either as a spray or to snuff same up. Should they fail to respond to this treatment they are given, in addition, some of the coal tar group of drugs with a very small amount of atropin.

*Throat Affections—Acute Follicular Tonsillitis:* The writer has used the dye in eighteen cases of acute follicular tonsillitis, all having the usual symptoms of increased temperature, pain on swallowing, and crypts full of cheesy material and pus. First their throats were cocaineized, then suction applied to the tonsils. Next, the large crypts were curetted, followed by the use of the dye, which was injected into the crypts with a specially constructed spraying tip, the solution used in four directions. Then the dye was sprayed all around the throat and postnasal space. Several of these cases required two treatments, while others required one or two more. A mild alkaline gargle was used, followed by a gargle with the dye.

*Chronically Diseased Tonsils:* In cases where general conditions contraindicate a tonsil removal, the tonsil suction tube is employed, the crypts curetted, and the dye injected into the crypts. These active tonsils quiet down, and any symptoms that they may have caused are certainly relieved. Remember, this method does not take the place of a careful tonsillectomy. One can keep these cases very comfortable for a great length of time. In this manner, in fact, one case is coming to me for over a year, as the patient states that he would rather come often and be treated than to have his tonsils removed. Two cases of streptococcus throat were treated in this manner, and the infection cleared up in five treatments.

*Vincent's Infection:* Two cases of Vincent's infection (confirmed by laboratory findings) were seen. One case cleared up with two treatments, and the other under four treatments. The patients used the dye at home as a gargle also. In both of these cases the ulceration was limited to the tonsil.

*Leucoplakia (tongue):* One case does not give us much to go by, but this case is of sufficient interest to be reported. Mrs. N., age 51 years, has been a patient of mine since 1910. She first consulted me June, 1910, for a chronic hypertrophic pharyngitis. She also suffered from a leucoplakia of the tongue. No treatment was given for the latter condition, as the patient informed me that she had been treated for it for years without any benefit whatsoever. In August, 1912, a part of her uvula was removed in order to relieve a bad cough. During July, 1920, she was treated for a postnasal catarrh. In November, 1921, she called, complaining of a painful gland in the anterior triangle of the neck. Also for a cough which was due to hypertrophied lingual glands, which were destroyed with the galvanocautery, followed by a complete disappearance of her cough. Leucoplakia had increased in area of development. Nevertheless, no treatment was applied by me. In December, 1922, the patient con-



sulted me for a peculiar feeling of fullness under the right side of her tongue. Examination revealed nothing whatsoever of the nature of an enlarged gland, etc. (I forgot to mention that when she consulted me in 1921 for a painful enlarged gland all that was applied was tr. iodin locally, and after three treatments the swelling disappeared; leucoplakia unchanged.) The patient remained away until February, 1925, when she called, complaining of a lump on the side of her tongue which had ulcerated. She brought along a laboratory report from her physician, who is a pathologist connected with a large hospital: (Blood Wassermann, negative). This report showed a Vincent's infection. Her leucoplakia appeared unchanged in appearance since December, 1922. Upon examination, a hard mass occupying the region of the sublingual gland running onto the lower ramus of the jaw (right side), which was hard to touch and painful, was seen, presenting an undermined ulceration with red and inflamed edges and covered with yellow, fetid secretion. No enlarged glands at the angle of the neck nor under the jaws were found. The patient refused a biopsy. Therefore she was treated for her Vincent's infection and the dye was used daily, the patient using it at home every two hours. After four treatments a smear taken and examined was returned negative for Vincent's infection, and the leucoplakia had cleared up considerably (in appearance and area of development). The patient stated that she experienced no pain when the tumor was palpated. Nevertheless, the growth had not diminished in size, though the fetor disappeared and the ulceration appeared clean. The patient was prevailed upon as to the necessity of a biopsy, to which she consented. The pathologist reported an epithelioma. The patient went to Johns Hopkins and had the growth removed along with the glands of the neck. This case interested me on account of the marked *improvement of the leucoplakia* after no other treatment by other men had made any impression upon it. The Vincent's was quickly cured, as was expected. This is not to be misinterpreted as a cure for leucoplakia.

*Larynx:* The dye has been employed in two cases of acute laryngitis where no other treatment was given. The dye was sprayed into the larynx, the patient inhaling slowly at the same time. Four treatments were required in one case and six in the other to effect a cure. Of course more cases were seen where the dye was used, but only two where it was employed alone. It is surprising how quickly the secretion diminishes under the use of the dye.

*Tracheobronchitis:* The dye was used in two cases of tracheobronchitis, but failed to attain any good result. This was due to

the fact that the dye failed to reach very far down the trachea. If the dye were used with a bronchoscope, the writer feels that we could relieve these attacks.

Owing to the fact of not having obtained good results in cases of tracheobronchitis, Dr. Abraham was requested to show me his technique in applying same. A case was treated shortly afterwards, and using this technique a perfect result was obtained.

*Furunculosis of the Nose:* It is in these cases that the dye is almost specific in its action. Thirteen such cases were seen and treated. The dye is pencilled on the furuncle until it dries and then a second coating is used (1-200 acriviolet). The gauze is lightly packed into the nostril, and the patients given some of the dye to use at home, wetting the gauze every two hours. Nine of these cases opened naturally, and the other four failed to suppurate. One of these cases had four perforations through the skin and two openings through the inner nostril. There is no special number of treatments given; simply they were treated until entirely well.

*Furunculosis of the Ear:* Four cases of furunculosis of the external auditory canal were treated. The treatment employed was, namely, to paint the auditory canal, allow the dye to dry, and repeat the procedure until stained a deep purple. Place a gauze wick in the canal, and have the patient keep the gauze wet every three hours with the dye. All of these cases had to be drained before they cleared up. The writer feels that if one can get these cases early enough, one can avoid opening them.

*Acute Purulent Otitis Media:* After incision of the membrana tympani a few drops of the dye are instilled before leaving the patient's home, cotton placed in the external auditory canal, and no irrigations given. The following day when the ear is seen, it is treated thus: the external ear is vaselined and the tragus cleansed of all secretions (from the canal). The ear lobe is drawn upward, forward and outward, the same as one would hold the ear to place an ear speculum; then the canal is filled with the dye, the patient swallowing, and at the same time the tragus is pressed in tightly, driving the dye into every available space through the perforation (natural or operative) until it appears through the Eustachian tube, the patient expectorating same. The writer feels that this sterilizes every part of the middle ear, including the Eustachian tube. This is repeated daily, and one is really surprised how quickly the ear condition clears up, providing there are no mastoid or other complications present. Many cases of mastoiditis that are not present at the time of the ear incisions, may be prevented; though that, of course, we do not know definitely.

*Chronic Purulent Otitis Media:* Four cases were treated. X-ray showed no active mastoid involvement present. Discharge cleansed, necrotic bone removed as well as polypi, and granulation tissue curetted away. Then the dye is used in the same manner as described for acute otitis media. Where there is only an opening in the membrane, especially Shrapnell's, a Hartman attis cannula (modified by Dr. Joseph H. Abrams) is used. This will shoot the dye into the epitympanic space, and permit sterilization of the cavity. Since this paper was written one case returned with aural discharge, but three treatments with the dye cleared this up. Probably reinfection by way of the Eustachian tube. One of these cases had aural polyps and had been discharging for over twenty years. Radical mastoidectomy had repeatedly been advised in this case.

*Use of the Dye at the Time of Operation:* After all operations upon the nose and throat the dye is used, and cleaner wounds result with less pain postoperatively. After tonsillectomy the tonsil cavities are swabbed with the dye before the patient leaves the table. Also after submucous resections a pad of sterile gauze, enclosed in a perforated rubber tissue casing, is placed so that the flap is in perfect apposition and wet with the dye. Its removal subsequently is painless.

*External Otitis:* Two cases of external otitis were treated; they had no discharging ears. One took two months to clear up, and the other (the wife of a physician) took over three months. The dye was applied in each case on the average of three times weekly. The latter case was of several years' duration and the itching intolerable. All kinds of ointments were used, with little or no effect. This case had set up an acute exacerbation when the patient consulted me for relief. Nothing was used except the dye until nearly the end of the treatment, when scarlet-red powder was used twice. The powder was used as the auricular part of the eczema was very wet and the dye would not adhere to the ear lobe.

*Diseases of the Accessory Sinuses:* The method pursued in these cases was to have the sinuses X-rayed first. Second, where the fetor was bad and discharge profuse a blood Wassermann was taken. Then if there were no other sinuses involved (except the antrum) the latter is entered with a trocar and washed out with a mild pot. permanganate solution, 1-8000 (Dr. Abraham uses a 2 per cent bicarbonate solution), and then 4 to 6 c.c. of 1-200 acriviolet solution is introduced through the same cannula and allowed to remain. This procedure is repeated every forty-eight hours. Four to six washings are necessary to sterilize this cavity in uncompli-

cated cases, with a resulting cure. (The writer trusts that he is correctly understood that these are uncomplicated cases.) Chronic antral infections are treated with the operation best suited for each particular case, with removal of all necrosed bone and polypi, exenteration of the ethmoid, etc., the dye being used as a final application to the parts operated before the sterile packing is introduced. Should these cases continue to suppurate after a complete removal of all necrotic tissue, then varying strengths of silver nitrate solutions are used, alternating with the dye, and gradually working up to very strong solutions. The silver nitrate treatment was first brought out by Dr. Abraham in 1907, and reprinted in *THE LARYNGOSCOPE*, May, 1907. Granulations are brought down admirably with the above mentioned treatment. Sphenoidal infections are treated with the introduction of the dye into the sphenoidal cavities through their natural openings wherever possible. If not, the middle turbinate is removed and the anterior wall of the sphenoid opened, cleansed and the dye used on the gauze packing. In chronic or acute frontal sinusitis the dye is injected through the cannula, allowed to remain forty-eight hours, and then cleansed out with a 2 per cent bicarbonate of soda solution. Should this fail within a reasonable time, then more radical procedures are indicated.

This report is merely a personal experience with the dye covering a period of nearly two years, and the results obtained are sufficient to have other men give it a fair trial. The dye is not very irritating and is readily borne by the patient. I believe the skeptics who have used the dye and thrown it down have not pursued the proper procedure in applying it. Also, while the dye keeps well, it is better to have it prepared fresh daily.

*Comment:* You are no doubt familiar with the U. S. Health Reports in reference to the so-called epidemic of grippe colds during the late fall and early winter months, which are followed in many instances by various degrees of sinus infections. The dye used judiciously in these cases prevents many of the above mentioned sequelae. Also, the preoperative use of the dye, as well as the post-operative application of same, results in more rapidly healed wounds.

#### CONCLUSIONS.

The dye has been found efficacious in all types of infections where the cavities were accessible; also in external infections, such as nasal furunculosis, etc.

133 West 72nd Street.

## THE NEW YORK ACADEMY OF MEDICINE.

SECTION ON LARYNGOLOGY AND RHINOLOGY.

*Regular Meeting, Dec. 17, 1925.*

DR. A. P. VOISLAWSKY, *Chairman.*

DR. A. P. VOISLAWSKY said that for a number of years having watched with growing concern the legal proceedings so frequently following the operation for the removal of the tonsils, and with the idea of laying our cards on the table, as it were, and having it out with those who have taken occasion to find fault with the medical man, the surgeon who has devoted himself to helping the layman rid himself of disease, he had taken it on himself to ask Dr. Harris to read a paper on the end results of tonsillectomy, with special reference to the legal aspects of the subject.

### **End Results of Tonsillectomy, with Special Reference to the Legal Responsibility.** Dr. Thomas J. Harris.

The operation of tonsillectomy at the present time is much to the fore. Its seriousness has been minimized to such an extent that the general practitioner regards himself competent to perform it. The inevitable consequences are that among the innumerable operations performed many bad results have taken place and many accounts of damage suits at present are current. The purpose of this discussion is to ascertain just what the grounds for these actions have been and to know what legal rights and responsibilities a surgeon has in performing this operation. A questionnaire was sent out to one thousand laryngologists, inquiring about all suits threatened or begun of which they were aware. Replies were received for the most part from trained operators and so are not entirely an accurate criterion, but a sufficient number was received from all parts of the country to warrant a careful analysis and drawing certain conclusions.

Of 124 cases threatened or instituted, only 4 were decided in favor of the plaintiff; 15 were decided in favor of the defendant. The grounds for action included negligence or carelessness during or subsequent to operation, 25; postoperative hemorrhage, 9; lung abscess, 5; breaking of needle, 1; anesthesia, 13; operating without permission, 5; death due to operation, 31; operation during or too soon after diphtheria, 4; removal and sloughing of palate, 12; removal of uvula, 16; removal or contraction of pillars, 8; teeth knocked out, 5; death due to operation, 31; loss of singing voice and speaking voice, 4.

Cases occurring in New York State, 15; cases dismissed by judge, 12; cases settled out of court, 24; cases that came to trial and later appealed, 5. Judicial opinions are handed down only in appeal cases. Of these the number is few, only 5. The opinions in 3 of these are of particular interest.

In the first case the higher court sustained the findings of the lower court in declaring that it was within the judgment of a surgeon to select the form of anesthetic, local or general, which he thought best in a given case.

In the second case, one for negligence in cutting the tongue during the operation, the higher court held that carelessness and negligence in performing the operation was a just cause for action.

The third case, in which a causal connection was claimed between certain physical ailments and loss of uvula during the operation, the higher court sustained that finding of the jury in favor of the plaintiff as far as the resulting injury and damages were concerned.

The outstanding principle in malpractice suits recognized by courts in all states is forcibly illustrated in four cases in favor of the plaintiff: namely, that want of ordinary and reasonable care leading to a bad result is legitimate ground for action. The following deductions seem warrantable:

1. The number of malpractice suits in the eastern states at least does not appear to be at all in proportion to the total number of tonsil operations.
2. The actual number undoubtedly is on the increase. This is due in part to the greatly increased number of operations and in part to the incompetency of the operator.
3. The bringing of such suits is dependent in most instances on injudicious criticism of brother practitioners or on efforts of commercial lawyers.
4. Almost every conceivable ground for action has been employed, but not one of these *per se* renders the operator liable to action. All depend on the single question, did he exercise reasonable care and skill in the operation and after-care?

The surgeon must constantly recognize his potential liability. He is at liberty to operate wherever he may choose, but the operation is a capital one and whenever possible should be performed in a well equipped hospital. The want of ordinary and reasonable care leading to a bad result is most common of all grounds for action. To establish this testimony an expert witness is necessary. Most bad results are due to incompetency on the part of the operator. There is a pressing need for the public to be educated upon the importance of the tonsil operation and of necessity of this being performed by a competent operator. The largest step in this direction is the recent organizing of the American Board of Otolaryngology, composed of representatives of the four national societies specializing in these subjects, which passes on the qualifications of candidates and when satisfied of their competency awards a certificate of approval. General support of the movement by all accredited laryngologists will be the greatest step forward in discarding the so-called "six weeks specialists." In spite of the fortunate experience of most of us in never having been annoyed by a malpractice suit, it is possible for it to occur to anyone, even after the greatest care has been exercised. On that account the defense work done by the several state societies and especially that of our own state society is deserving of the heartiest commendation.

#### DISCUSSION.

GEORGE W. WHITESIDE, Esq. (Counsel for the Medical Society of the State of New York): Twenty-seven years ago the Court of Appeals enunciated the rule of law which ever since has controlled the measure of legal responsibility of the doctor in suits for malpractice. This case does not place a heavy burden of legal responsibility upon the physician and requires that the physician possess a *reasonable degree* of learning and skill that is *ordinarily* possessed by physicians and surgeons in the *locality* where he practices, and which is *ordinarily regarded* by those conversant with the employment as *necessary to qualify him* to engage in the practice of medicine and surgery; he is not required to possess extraordinary learning and skill that belong to a few of rare endowments, but only such as is possessed by the *average* member of the medical profession in good standing.

In twenty-seven years since this case of *Pike v. Honsinger* was decided, there has been much progress in medicine and surgery and an increasingly broad field has been pre-empted by the specialist in various departments.

Later cases while not changing this rule of malpractice have tended to recognize the changed conditions due to the practice of specialties, and the Court of Appeals in 1921 in a case made this observation:

"The defendant did not diagnose the trouble correctly and did not advise his patient to resort to others of wider experience for help."

And the court said that the jury might properly find that he was guilty of malpractice in this regard. In this statement the court recognized the duty of a physician to advise consultation with a specialist under conditions where such consultation was indicated (*Benson v. Dean*). In this regard the court said specifically:

"If a general practitioner has reason to doubt and under the circumstances should doubt whether he has the competent skill and experience to handle the case himself, the question arises whether good judgment does not require that he should advise his patient to consult another more skillful surgeon."

This change does not mean that there has been any abandonment of the earlier rule that measures the degree of skill or learning by that ordinarily possessed by the physicians in the locality where the defendant is practicing, but clearly indicates that under the conditions now existing it will be assumed that the man possessing such reasonable degree of learning as ordinarily possessed by those in his locality would realize his limitations and the necessity under certain conditions of advising his patient to see one possessing peculiar skill in a definite specialty, where such consultation is shown to be reasonably necessary. Likewise, under the general rule made twenty-seven years ago, the physician possessing the ordinary qualifications was not called upon in his diagnosis to employ laboratory and X-ray procedures for diagnosis to the extent that later developments of those specialties require them. Today the measure of what the average physician is required to do is much more exacting and strict by reason of the fact that there are available to the average practitioners these diagnostic aids. So when, where and how tonsillectomy should be performed is becoming more and more, under these changed conditions and modernized rules governing malpractice, a question that must be resolved by the specialist.

Malpractice litigation is largely for the patient and the physician an economic loss and methods and means should be found to reduce this economic loss by as far as possible removing the causes of such litigation. In my office there have been handled in the last five years 661 malpractice actions against physicians in this state at a total cost in one year, including moneys paid on judgments, settlements, legal fees and disbursements, of over \$100,000. The handling of this volume of business has required the employment of four men and two women and considerable time of both members of my firm in trials in court. Ultimately this entire cost is to be absorbed in one way or another by the profession. This mill can keep on working and the grist will come as before, unless more enlightened efforts are made through the profession and by the profession to study and endeavor to eliminate the causes of malpractice litigation.

The preparation of Dr. Harris' paper and its consideration by this Academy are steps in the right direction. I have endeavored to awaken interest in this subject by the report in the state medical journal of cases that have gone through my office. Mr. Oliver, my associate, who will follow me in this discussion, will give you some idea of what must be done in a malpractice action before it is reached for trial. This may be multiplied by 661 to determine the labor which this work entails. To reduce cost and increase efficiency typical American principles governing quantity production have been invoked, otherwise the cost of handling such a volume of cases would have been exceedingly high.

Eighteen years ago the medical profession surrendered to a lay body the government, supervision and control of the practice of medicine. This year an effort will be made to recover that right and place in a legally constituted body of medical men the exercise of disciplinary functions over members of the profession. The Committee on Grievances so constituted could do much under the plans that I have formulated to reduce this enormous malpractice hazard. Should nothing be done then naturally the insurance carrier that under the group insurance plan sponsored by the State Medical Society has outstanding many millions of potential liability in insurance policies, will have to take steps to minimize their hazard of malpractice actions. The action of such companies in general liability cases, through inspections of buildings on which they carry accident liability, requiring the removing of certain defects that give rise to accidents, such as torn step carpets and the like, had a salutary effect in that department of insurance and it would hardly be unreasonable for such an insurance carrier to insist upon physicians insured by them keeping proper records of their cases, having proper evidence of the doctor's dismissal from a case terminating his legal responsibility, or procuring proper evidence of his withdrawal from a case to prevent his being held responsible for neglecting to attend a patient; to require proper authorization for operations from a patient or the parent or guardian of an infant, and the like.



Dr. Harris has referred to the general cause of malpractice litigation in tonsillectomy cases as being the claim of a want of reasonable care or skill leading to a bad result. This is a general blanket statement that is very flexible in its application, but includes definitely among others the following:

- a. A departure from approved methods, causing injury;
- b. Proof that the bad result would not happen when approved methods are used;
- c. Proof that result was due to failure to use approved methods of diagnosis by which the real disease would have been ascertained and treatment that was given would have been contraindicated;
- d. Proof that a mistake of judgment was the result of a lack of knowledge, skill or care;
- e. Failure to use modern diagnostic procedures and treatments that have become ordinarily standardized when such failure leads to a bad result.

The trial of malpractice actions depends largely upon expert testimony which make the trial of such actions a distinct specialty within the already specialized trial practice. There is much that is misunderstood about expert testimony. The Court of Appeals, Werner, J., writing, clearly classified two types of expert testimony: 1. Where facts are peculiarly within the knowledge of men whose study and experience enable them to speak with authority, they may give expert testimony of such facts, the jury drawing the conclusion. 2. Where facts as well as conclusions depend upon scientific and professional knowledge or skill not within the range of ordinary intelligence, experts may testify as to the facts and the conclusions.

In the first instance the facts are to be stated by the expert and the conclusions drawn by the jury. In the second, the expert gives the facts and also his conclusion in the form of an opinion. For example, in the first instance, an expert banking man could describe the usual and ordinary methods in a bank dealing with signatures and identification before making payment and the jury would have to draw the conclusion if the payment was made properly and to the proper person. One could not ask such an expert if the misspelling of the name of a depositor should cause suspicion in the mind of an ordinarily competent clerk. He would describe the methods by which the ordinarily competent clerk undertakes to identify the depositor and the jury would have to determine whether or not the ordinarily competent clerk should have to be put upon inquiry by the misspelling of a name on a draft presented by a depositor.

In the second type belong the trial of malpractice cases where medical experts communicate to the jury, who are not versed in medicine, testimony in the form of reasons, arguments and opinions.

In a malpractice action, therefore, the fact that a man is a physician is all that is legally necessary to qualify him to give an opinion and by giving such opinion he creates an issue of fact which the twelve lay jurors must determine. The weight to be given to that opinion is for the twelve laymen to determine. He may be a laughing stock to the medical profession, but his testimony is sufficient to create an issue which must be determined by the jury. I have seen many cases where men admittedly unqualified scientifically to express an opinion have been able to swear a case over to the jury on opinions that were unscientific, unsound and at times dishonest, thereby placing a brother physician in great jeopardy. With a self-governing profession having a proper committee on grievances with adequate power, such evil could readily be minimized.

The ultimate conclusion of this matter is that upon the profession itself rests the responsibility of reducing the legal hazard of malpractice and by doing justice to the claimant as well as the accused, ultimate benefit will result to the profession and to the public.

DR. H. L. SWAIN: This has been a wonderful evening. As my much lamented friend, Dr. Mackenzie, of Baltimore, used to say: "This is an important subject and needs to be thoroughly ventilated." And it has been most delightfully done tonight.

Time influences many things, and during nearly forty years I have had a chance to look into the throats of the young men at Yale who have been attended to and operated upon by the best men in the country. When we talk about end results and what ought not to happen, it is hard to lay down any hard and fast rule which may be considered definite and final, for there are accidents which may happen to the very best of operators. When we, the country over, stopped doing tonsillotomies and did tonsillectomies, a good many mutilations took place. Everyone had them and when I used to look at these throats it was interesting, revealing and often times extremely comforting to see that the fault was not with any one operator. We had not learned how, and these results showed that it is impossible for any man to operate and get a perfect outcome every time. Dr. Coffin spoke about the perfect tonsillectomy and how rare it was. He surely did one for me. It was, and remains, good. When we consider such work as this and which now is being done by many others, as demonstrated in the students' throats, there is no doubt that things are changing everywhere as a result of wider knowledge and a more skillful technique. And I have another point of view worth while remarking upon. It has come to be almost a rule in preparatory schools that the young girls and boys—of whom I also see a good many—shall, if possible, come without tonsils and adenoids. It is regarded almost as good form, to be without them. If they have them then the school authorities frequently desire them to be O. K'd as at the time though present healthy and not liable to make trouble. As I see this still younger group and find them nowadays tonsillectomized, and almost always admirably done, I can truly say, as is said of the radio: "They are coming through fine." The results are infinitely better than they were ten or fifteen years ago. That then is the very lively hope I have, that as so much better work is being done, there will soon be nothing to be sued for.

It was a rare pleasure to hear from the legal profession at a medical gathering and I was particularly pleased to have them state it was up to us to do something ourselves, not only in better work, but in building up a better public opinion, etc.

How can we expect the public to know and to rightly understand and appraise these things when our own opinions as to what is to be expected of our work vary as they do? We must get a saner opinion of our own and not promise too great immunity from further trouble before we can expect the public not to sue us. If we could only be wise as serpents and as harmless as doves, it would be quite ideal.

ROBERT T. OLIVER (Attorney, Medical Society, State of New York): Dr. Harris in his paper has spoken of the end results in tonsillectomies, and Mr. Whiteside has reviewed for you certain of the legal principles applicable to malpractice actions. I shall endeavor, in my remarks, to point out the work that is necessary to accomplish these end results—in other words, the work that is done behind the lines.

A physician oftentimes believes, when a summons and complaint has been served upon him, that all it is necessary to do is to forward it to us and nothing further is done with it until such time as he hears a year or two hence that the action has been disposed of. This, of course, is not true and work in connection with each of the actions is going on more or less continuously.

Upon receipt of a summons and complaint the necessary entries and records of it are made in our office, and if the physician is insured information is transmitted to the insurance company so that he may receive the benefits of his insurance under the group policy. An examination is then made of the complaint to determine whether it states a cause of action or whether any motion should be made thereto, such as to strike out irrelevant or redundant allegations which may be detrimental to the defendant; to compel the plaintiff to separately state and number his causes of action should the complaint contain more than one cause of action; to dismiss the complaint on the ground that the cause of action is barred by the statute of limitations if the malpractice complained of antedated the institution of the action by more than two years.

If no motion is made in connection with the complaint, an answer must be prepared and served. In the preparation of the answer a statement from the defendant of his examination, diagnosis and treatment of the plaintiff is procured. For an amplification of the allegations of the complaint it is oftentimes necessary to procure a bill of particulars. This is done by demand, but if the demand for a bill of particulars is not complied with, then a motion must be made to compel the service of a bill of particulars.

After the answer has been served in behalf of the defendant, issue has been joined and either party is at liberty to place the case on the calendar, where it takes its position and awaits its turn for trial.

However, it is our practice to make a complete preparation of the case while the facts with respect thereto are fresh in the minds of the persons cognizant of them. Not only is the defendant physician interviewed, but likewise any other physician who may, either before or after the treatment complained of, have attended and treated the plaintiff; likewise the nurses or other assistants who may have any knowledge of the facts. This work is done by having a trained investigator, possessed of medical knowledge and skilled in this line of work, visit these various persons at their respective offices. If the patient has been in a hospital, the hospital record is procured, which should include the history chart, the operating chart showing in detail the nature and extent of the operation; laboratory reports; if X-rays were taken either of the negative X-ray films or reprints of the same, and the Roentgenologist's interpretation of the X-rays. All of the facts and records are carefully collected and preserved in the file of the particular case in our office, to be available at the time of trial. In death cases it is necessary to procure a death certificate and, if the medical examiner has been called into the matter, to procure the autopsy protocol, all of which are carefully examined and studied.

To determine to our own satisfaction the nature and extent of the injuries complained of by the plaintiff, a physical examination is had of the claimant. This is usually consented to when requested of the plaintiff's attorney. However, if this consent is not given it is necessary to prepare and procure an order of court compelling the plaintiff to submit to an examination by a physician appointed by the court. The practice is frequently resorted to by the plaintiff's attorney of procuring an examination before trial of the defendant. This is done for the purpose of enabling the plaintiff to ascertain whether he has a cause of action or to procure from the defendant, in advance of trial, knowledge of the defendant's treatment of the plaintiff. The examination is procured by serving a notice upon the defendant and his attorneys. However, if the notice does not comply with the statute or is too broad in its demand or seeks to procure information from the defendant which the plaintiff is not entitled to, a motion is then made on behalf of the defendant to vacate or modify the notice of examination before trial. At the time of the holding of this examination it is necessary to attend with the defendant while he is being examined by the plaintiff's attorney and protect his interests at the examination. A memorandum and briefs of the law which each case presents have to be prepared. As many of the cases involve intricate medical questions, the medical literature has to be carefully and extensively examined and studied so that we may possess that necessary medical knowledge properly and carefully to protect the defendant's interests. To sustain the defense in any malpractice action the testimony of other physicians is necessary, and these physicians must first qualify as experts and testify in that capacity. Conferences must be had with these physicians so that they may be made cognizant with the facts by careful study and analysis of the medicine involved in the particular case.

This is part of the preparation in each malpractice action and is the work that goes on behind the lines, of which you physicians have no knowledge. You observe the open display of this preparation only at the time a case comes to trial. A great number of cases do not actually come to trial, but are either discontinued or dismissed at the time they are about to be reached for trial, when the plaintiffs' attorneys, finding their burden is too heavy or knowing

that they have no real cause of action, finally consent to the discontinuance of the actions.

Indeed, to be in a position to compel the plaintiffs to discontinue their actions or demand a dismissal of the same, we, on behalf of the defendants, must be ready to defend the actions into their various ramifications, and this ability is acquired only by virtue of the most thorough preparation. A review of the following case will illustrate the nature of the preparation and disposition of a malpractice action.

Assuming that a girl, age about 16 years, calls at your office accompanied by her adult sister. You are asked to examine the throat and tonsils of this girl and are given a history of repeated attacks of tonsillitis. Upon examination it is found that the tonsils are submerged, that there is no acute inflammation or pus present. A removal of the tonsils is advised, the patient being given the choice of having the operation performed either at her home, at a hospital or at your office, the latter being fully and competently equipped for that purpose, there being a rest room in connection therewith which is supervised by a competent trained nurse.

Four days thereafter, pursuant to the arrangement, the patient again accompanied by her adult sister, calls at your office. In the morning of that day under a local anesthesia administered by your assistant, a competent and qualified physician, a tonsillectomy is performed. There were no complications or untoward events during the operation and the same was accompanied by little bleeding, the tonsils being completely enucleated. The patient was then put to bed in the rest room under the care and supervision of a special nurse, and she remained in bed until the evening of the day of the operation, when she returned to her home. Instructions were given at that time for the patient to return for postoperative treatment four days later. The patient was also advised to remain in bed, ice bags to be applied to the throat and to frequently gargle and to be placed upon a liquid diet and the operating physician kept informed of the progress of the patient.

Four days after the operation the patient called at the physician's office. An examination disclosed a clean throat, normal temperature, there being a little pain and swelling. On the following day the physician was requested to call at the patient's home. Pursuant to the call the assistant responded thereto, at which time he found the patient with a slight temperature and a slight swelling of the left cervical gland. On the next day the physician called at the patient's home, the swelling at that time being about the size of a hen's egg and tender. On the following day the patient was again seen by the physician, at which time the family physician was also present. The family was advised to call a general surgeon for the purpose of operating upon the infected gland. The family physician desired to perform the operation, but a surgeon was called in who incised the abscess. Upon the day of the operation the physician who had performed the tonsillectomy spoke with the family physician and asked if there was any service he could render and was told there was no need of his presence at the operation. Nothing further was heard from the case by the physician who performed the tonsillectomy until about a week later, when he was called to the patient's home and at that time there was present an eminent surgeon who had been called in by the family because the patient's condition had not improved. The physician who performed the tonsillectomy furnished the surgeon with a complete history of his operation for the removal of the tonsils and his treatment of the patient. The second surgeon advised a further incision of the abscess and the removal of the patient to a hospital for the purpose. The family inquired if the operation should be done that day, in response to which inquiry they were told by the surgeon that there was no immediate danger, that the operation could be done just as well on the following day, except that leaving it until the following day would only delay the convalescence of the patient.

The patient was removed to the hospital and the abscessed gland was operated upon by the second surgeon. About five days thereafter the patient died from a cellulitis of the cervical gland and a thrombosis of the jugular vein.

An action was then instituted against the physician performing the tonsillectomy, charging him with negligence in his operation and in his after-care and treatment of the patient and seeking to recover damages from him, and holding him responsible for the death of the patient. The complaint charged that the operation was carelessly and negligently done, in that he had removed the tonsils when active suppuration was present and had administered a local anesthesia while the tonsils showed the presence of pus. The complaint also charged him with failure to respond to calls to visit the patient at her home and in rendering improper post-operative treatment so as to prevent the infection of the cervical gland and the jugular thrombosis resulting in the death of the patient.

A verdict in favor of the defendant or a dismissal of a malpractice action is often the end result; but this end result is accomplished only because of the exhaustive preparation which enables us to force the plaintiff to trial and to defend the physician in the performance of the tonsillectomy and other operative procedures and to demonstrate that there was no carelessness or negligence upon the part of the defendant physician in his examination, diagnosis or treatment of the patient.

EDWIN A. JONES, Esq. (Attorney-at-Law): I have no prepared paper and did not intend to speak in any such way, but when asked to take part in this discussion I first studied the title, which began "End Results of Tonsillectomy," and I wondered what that meant, because that word "end" may mean many things, depending on how you use it. If it means how and in what way we may hope to discourage these suits for malpractice it is one thing, it may mean another thing than that from the doctor's standpoint. I have made notes of some means by which you may discourage—not end—malpractice suits.

But first I wish to say a word about what has been said by Dr. Harris, Dr. Whiteside and Mr. Oliver, all well qualified in this matter—first as to Dr. Harris' statistics, and then as to the legal liabilities of the physician, as enunciated by Dr. Whiteside, and you should give him the degree of M. D., and then as to the amount of work of preparing such a case, as mentioned by Mr. Oliver.

Dr. Harris referred to operations under anesthesia, without consent, as a basis of suit for malpractice, and how it was necessary with an infant under twenty-one to have someone present who should be able to so consent to an anesthesia. Do you know how that need of consent arose?—that where you are giving an anesthesia you must have consent to scope of operation—that if when operating under anesthesia you find something that you did not know about before, needing operative treatment, you would be liable in operating on such new-found condition without consent? That arose in this way—and we are indebted to Dr. Garrison, an eminent surgeon of New Jersey, who gave up the practice of medicine and took up that of law, in which he likewise rose to distinction. In the old days there was no such thing as anesthesia, and if a man operated to take out one organ, and the surgeon found that another organ needed removal also, or something required of departure from postoperation plans, he could turn to the patient and ask him if he could go ahead with the changed condition and operate on the other organ. It was because of that experience that the rule of law arose that you could not do anything that was not understood upon before the anesthesia, etc. Anesthesia had not changed the law as to operation consent. Judge Garrison got an opportunity to explain that rule and how it arose and developed and to smash it in the state of New Jersey. He said that with the coming of anesthesia that rule of law should be changed, and it was changed by his decision, concurred in by his associates, so as to give to the operating surgeon the right to do what he thought was necessary and advisable under the conditions with which he was confronted after the anesthesia and operative exposure of the parts affected. He could go ahead and do what was humane to do, but no other state has as yet adopted that rule so far as I am informed, but it is based on good common sense and should be followed in all states.

There is and has been a gradual drawing away from what is known as the operation without consent, as respects conditions appearing under anesthesia.

Another thing: Dr. Harris referred to "shysters" lawyers and then to "commercial" lawyers. I thought I was a commercial lawyer, but not under Dr. Harris' intendment. It may be well that you go back to the New Testament, where there are so many references to the fact of "a certain lawyer." There are no "certain" lawyers, they are all uncertain; so is the law; so is medicine. We lawyers are judged by the same rules of law, the same rules of conduct, as the medical practitioner; we have the same rules of care and skill, which is the care and skill of the reasonably careful practitioner where we practice.

Then a word as to the term "shysters": Down on the lower east side there was a big court for that locality, and there used to be a lawyer named Shuster (not shyster), who was known for sharp practices. He would get an opponent called out of the courtroom on a pretext and take judgment against him while he was out. If he did not want to try a case he would get a clerk to let him look at the file and then take the papers and the court could not try the case without the record, would read law from a book to fit his side of the case, close the book, and then later could not find what he read for court or opponent, stipulations never went with him if privilege or advantage could be obtained by denying them, etc. Finally the court got on to Shuster, and when an attorney sought to do an unfair thing of that class, the judge would say to him, "Don't do that, that's Shuster's practice;" and so any attorney guilty of cheap tricks or who seeks unfair advantage, or sues when there can be no justification and only to annoy has come to be known as "shyster practice."

You have referred to a jury trial where facts are to be decided—that is considered by some as unsatisfactory method of finding facts in malpractice cases. I know of no better plan to ascertain disputed facts. Where the facts are disputed and the truth must be determined, the court charges the jury as to the law as it should be applied to the facts as the jury may find them—the jury determines the facts and applies the law as given them by the court. It is said they are incapable of determining a malpractice issue. Some would say these cases should be heard by a jury of expert physicians—where would the general practitioner get off? I am opposed to the jury of experts in such cases. I would rather have a jury than a trial before as many judges, and give me the jury of the average laymen from all the qualified—too many get excused. There are many defects in the jury system, but on the whole give me a trial on question of fact before what are called our peers of laymen.

Then there was some reference to the care of the reasonable practitioner. Many people think that is wrong, and that when you apply to a specialist the degree of care should be different because he is a leader in his profession, and that the case of specialists should be on a higher basis than of one who has just hung up his shingle—or the average general practitioner. Now there is no general rule of law that I know of that a specialist is to be judged by the knowledge and skill of the specialist in his line. In the state of Indiana, the rule is that the specialist is governed by the care of the specialist, and the general practitioner by the rule of the general practitioner. I tried a case before one of our judges, who charged the Indiana rule in an eye case and the jury disagreed. The case was tried again and Judge Greenbaum declined the Indiana rule and the physician won, so even the judges are just as uncertain as the lawyers.

I know very little about tonsillectomy. I still have my tonsils. No doctor has looked in my mouth, probed any crypt therein of mine and told me that my unhealthy condition was due to my tonsils or that if he only took the tonsils out I would win every case I tried, etc., so I speak without any great degree of personal knowledge. My tonsils have never been ectomied nor otomied. There are many things here I don't know—an admission I am frank to make outside the courtroom—especially about tonsillectomy, but as I read



this title—and it's all I had to prepare on—it is an inquiry as to how to "end results," and I said to myself: What does that mean? End! It may mean all the tonsil has been ectomized—is out—or may mean arrangements for paying the judgment. Does it not mean: How to discourage this growing fact of the great increase of malpractice cases, whether tonsillectomies or anything else?

You cannot "end" them. That is impossible; you can discourage them, and the people to do that are the medical profession themselves. How can they do it?

First: From the doctor's standpoint: Avoid criticism, knocking and suggestive remarks of other's work. Don't say: "Did you say you went to a surgeon or to a butcher?" Don't ask: "How much did you pay this man? I would have done it for half that much." Don't say he performed an otomy and not an ectomy. Don't give the excitable lady the idea she has been the victim of some turkish outrage in your choice of words. Don't say: "That fellow operates on every patient, just to get experience, and he needs it." Don't say: "If you had only come to me in the beginning I could have helped you." Don't say: "Did he operate on you early in the day, for by noon he is never in condition where he can do good work." Don't say: "You paid him \$250.00 for such a job. It is now more difficult for me and I shall have to have \$500.00 to finish what he should have done—perhaps you can make him pay my fee."

I defended a former president of the Academy, and the physician behind his suit for malpractice was his closest personal friend. He would not believe it until he got to the trial, and then he did.

Then we may say that doctors are as much to blame for malpractice suits as is anyone else. No malpractice suit can succeed without expert testimony, but the courts nowadays will admit as expert testimony almost anyone who can show his diploma. But that doesn't mean he is an expert. It is still to be left to the jury to determine how much of an expert he is. But no lawsuit in malpractice will ever succeed unless behind it is a medical man to advise and aid the lawyer or to testify against the physician's practice, and you might as well look that square in the face.

Suits for fees provoke malpractice cases. If I have an ailment, I will give you all I have if you will cure me, but when you have cured me I want to pay only 10 cents on the dollar. Get your fee when you treat the case. Get your pay so neither bill nor suit is necessary to collect. Don't bring suits for small fees. I have a doctor now who is suing for \$7.00 for his fees and it has brought a malpractice suit against him for \$50,000—he wants his \$7.00 suit to go on.

Keep your materials and medicines out of sight. Keep your instruments out of sight. You may say: "I cannot do it." We had a case this week where a doctor had two solutions, one 90 per cent, one 2 per cent, both in view of the patient, who says he received the former, doctor says the latter—jury must decide which. If out of sight that testimony could not be given. Exclude relations and friends from treatment and operation and have a good nurse with you. Don't pick up an instrument and say it is dull, and don't swear at the nurse who gave you the wrong instrument. Don't say this instrument has not been washed, or is dull, or scowl at result when used.

Then make careful notes and keep good office records. Many do not keep any office records, or else keep insufficient ones. Good records are very important—kept in your own handwriting—not dictated to a stenographer like present hospital records, not signed, just dictated, so that hospital records are becoming less efficient and useful than ever to prove contents or even refresh memory. All typewritten records should be signed.

You have one thing to be thankful for. The X-ray does not trouble you. You are lucky that they don't X-ray the tonsils for radiographs, as the den-



tists do the teeth, and surgeons do for broken bones. A good external functional result looks all wrong under X-ray to a layman.

The general practitioner will call in the specialist, and that specialist has been known to go against the practitioner who brought him the practice and be the expert against his benefactor.

*From the legal standpoint:*

There are too many lawyers in this town, maybe too many doctors. There are too zealous lawyers, and they are increasing. When they hang up a shingle, they have to stir up some business; they like to say they have so many cases in the Supreme Court. They may have fifty cases in the Supreme Court and they all may not be worth \$50.00, but it sounds well. It adds, he thinks, to the eclat of the lawyer who has just hung up his shingle. Many lawyers advertise; I have heard that some doctors advertise. They write articles about themselves and their cases and hand them out to the press and are surprised when they read their own composition. A malpractice case is a good avenue for an advertisement; an action for malpractice always gets in the paper. Newspapers seem anxious to publish such stories if it concerns a physician—who by his calling should have some standing in the vicinity. And then many doctors are highly complimented in being sued for \$250,000. I am defending one doctor where the judgment asked is "at least \$1,000,000" and costs.

I defended a physician who diagnosed the case as chickenpox, when it was smallpox, and treated throughout for chickenpox. Other members of the family contracted the disease, some died; everyone of them had smallpox. One of the New York newspapers had pictures of all the people with long stories about it and said that the doctor's license should be taken away from him. We tried that case and we won it from a jury. The doctor testified he had never seen a case of smallpox, had studied it when in school years before, his only experience. He asked for a consultant. They said for him to do his best and were satisfied with him. He, notwithstanding, went to the Health Commissioner of the Port and the assistant examined the case and told him it was chickenpox, and he so continued treatment. Both were wrong. When the cases were won we tried to get that newspaper to correct the statements that had been published, but could get nothing done, not even the smallest paragraph that the physician had been cleared.

They ought perhaps to have a law here, that I understand they have in Missouri, that where a newspaper publishes an article about a suit for malpractice against a doctor it is made by law libelous *per se*, it implies damages, and the burden is on the newspaper to prove the truth of the published statement and not on the physician to prove it untrue. That law would stop some publications here.

Another way: You don't have to testify as an expert unless you want to. A physician's knowledge is his own property—does not have to give it out unless paid therefor. He may be made to testify as a lay witness, but not as an expert. Only today we won a case, defending a dentist for malpractice, because the plaintiff's expert did not get to court until the trial was over and we had won, but if that very expert had come to court in time he would have been a good witness for the defendant, for in that case he took up the expert treatment of the patient and we were sorry he did not get to court in time, because we think the plaintiff's lawyer did not know what we did.

It is easy—too easy—to sue in New York. I have been frequently told by physicians that a plaintiff had to put up fees and to pay costs before he could sue. He does not have to do anything of the kind. Not long ago a gentleman rode into high office because he blustered that he was in favor of the poor man's court—Municipal Court of the city of New York. It does not cost a plaintiff a nickel to sue in that court. He or his attorney can write out a summons, serve it, get his case to time of trial and not pay one cent. He can sue in any state court and does not have to pay anything until

the jury is sworn, and then in the Supreme Court he pays \$4.00. In no other state in the Union is the law so generous. We are somewhat so fixed in the city of New York, this poor man thinks this poor man's court has been formed to render judgments in his favor against one who has a few dollars more than he has. The judgment is to be in favor of the poor man. If he is the poor man of the litigation he considers he should win. I am only stating this to show how easy it is for the doctors to be sued, for anyone to be sued. In the United States courts before a plaintiff can start a suit he has to put up \$20.00, and that is more of a deterrent to suits than you have any idea of. In Chicago no suit can be started without depositing from \$15.00 to \$20.00 before summons is issued, and the attorney in most states is liable for costs if the suit started is lost. It is not so here.

Now when you get a judgment in your favor for costs, what good is it? In the Supreme Court you have a cost judgment for around \$125.00; can you collect it? Not in one case out of fifty. In the Municipal Court the costs thus awarded are less.

Let me give you an idea of how to stop, discourage, "end" some malpractice suits. It will not "end" all, but it will be a mighty discouraging factor in many. The statute of limitations for malpractice in New York is two years from the day when the cause of action accrues; in other states it is one year. If that period of time elapses before action is brought, then the claim is outlawed, the case is ended. There is no doubt but that this organization, with the state society, the county society and other medical organizations, can amend that law any time they want it done and it would stop the prosecution of a lot of these cases. We had a man from our office in the Assembly at one time and he asked me what bill could be introduced to invite some attention to him and to give him some popularity. I said perhaps a law making it one year for suits for malpractice, and not one member of your profession came or wrote to him in favor of the passage of that bill. I have no doubt you can go to the Legislature and make our statute one year like other states—one year for malpractice—you can make it the law. It will require organization and effort, but you can get it, for why should a physician doing a most humane service be subject to a suit after more than one year where the patient had one year to decide whether to sue or not, and how can it be expected that the physician sued after two years, when he sees so many patients, is able to recollect all of the various facts of treatment in the case that is two years old? Did you ever hear of a malpractice suit against a lawyer? They make mistakes like you do, negligent ones, and they can't bury their mistakes, and you can some of yours. Yet are they sued?

Another reason for so many malpractice suits: The Workmen's Compensation Law seems to invite malpractice suits. Before compensation the injured had to have the doctor's aid in his suit against his employer for damages for injuries sustained in the employment. If an employee desired to sue he had to stand in with his physician, for he was a very essential part of his proof, but when compensation came that seems to have changed, the doctor was no longer essential to his recovery of compensation and he then said he would take what he could get under compensation and then sue the doctor, giving opportunity for getting more and provide lawsuits for the lawyers.

So, when you follow it down many things contribute to the growth of these malpractice cases. The judges are not so willing to dismiss on the law as before, but more prone to submit to the jury some question of fact for its determination, to speculate on.

I have a very strong feeling about these malpractice cases. They sometimes stir up thoughts that I could almost be arrested for. I don't say that there are not malpractice suits for which payment should be made. I say there are. I have seen some cases where the license ought to be taken away from the man who produced the results, where he should be called a butcher and not a surgeon. I have seen crippled people where there was no justification for it that I could see, and I represented the physician.

I hope no one here would refuse to respond to the call of coming to the aid of another practitioner when that aid can be honestly given in the cause of truth. I have seen some of the finest ethics in the medical profession that anyone could think of, and I have seen some the opposite. I have seen a physician who could not get an expert to testify for him because it was well known that he would not respond to such a call from another, and when his trial came up we had to get along with a third-rate expert—we could get no one else.

The increase of malpractice suits is well to consider. Nevertheless there are ways and appropriate laws to handle them and, of course, there are instances of miscarriage of justice in malpractice cases as in other cases. No system of jurisprudence is perfect, or can be. Justice will go wrong, even though she is blindfolded, for there is no way to make these things an absolute certainty. I would not change the law, I would have you understand the law, have you understand what the law of liability is and how easy it is to bring these suits. I would have you understand the remedy rests with you very largely. Take these things in your own hands and you can "end" a lot of such trouble just by wise, efficient and co-operative conduct on your own part.

DR. LEWIS A. COFFIN: Dr. Harris' paper for discussion purposes presents two questions. First, end results of tonsillectomies; and second, grounds for legal action against operator by party operated upon. In my discussion I shall broaden the latter question and discuss it as though it were, what are the causes for legal action? As to the end results, no man doing a tonsillectomy can state with any degree of certainty what the end results of that operation will be, nor can he predict that he or some other man will not be obliged at a future date to do another operation in the same tonsillar fossa for the removal of lymphoid tissue. In a paper by Charles H. Richardson, read before the Laryngological Association in 1922, entitled "The Unpleasant End Results in Well Performed Tonsillectomies," he depicts many of the end results which have been recited by Dr. Harris as ground for legal action. Dr. Sluder, whose position in tonsillar work is an enviable one, defines a perfect tonsillectomy thus: "The part removed (*i. e.*, the tonsil) should be not merely a satisfactory specimen, but an anatomically perfect one with capsule absolutely intact." Dr. Sluder does not mention the condition of the patient. Tonsils are operated for the removal of actual, suspicious, or potential sources of infection and not for scenic or landscape purposes. It should be thoroughly understood both by the public and the legal profession that a tonsillectomy ending in very poor landscape effects may be an entirely satisfactory operation. In the closing paragraph of Dr. Richardson's paper he says, "Adhesion or shortening of the anterior pillar by its adherence to the dorsum of the tongue and the adhesion of the lower lateral wall of the fossae to the side of the tongue form another group. This group of accidents give rise to very uncomfortable symptoms if we are to accept the statement of patients. Extreme care is the watchword to prevent this accident. Occasionally it will occur in spite of our best endeavors."

Don't let anyone think I would decry extreme care and watchfulness. Every operation should be done with the greatest care, but really for other and better reasons than the avoidance of legal action.

There undoubtedly may, at times, be grounds for legal action in the end results of a tonsillectomy, but such cases are few as compared with the number of suits brought; therefore one must look for the causes.

I have been sued four times. Never for a tonsil operation, however; and my conclusions are that these malpractice suits for the most part are brought about by the meeting up of an emotionally hysterical parent (generally a mother) with an unprincipled lawyer whose cupidity is on a par with any bandit. The suspicious and emotional excitement of the nervous parent may have been aroused or increased, as Mr. Jones has intimated, by the visit of said parent to a doctor other than the operator who has been unmindfully

careless of his brother's reputation and welfare. Let us therefore be ever mindful, honest and sympathetic towards our fellow operators.

DR. WENDELL PHILLIPS: The discussion on the legal side of this subject has been most valuable and interesting. It has been my lot, however, to be called upon—perhaps more than some—to give expert testimony in these malpractice suits, and I have thus gained from experience some of the needed points and methods which may be helpful on the witness stand. I will state my conclusions briefly in order to get them into the record:

1. Every physician should make an exhaustive examination in every case.
2. He should record and file the complete testing of the case, preferably in his own hand.
3. He should take all preoperative precautions, and as far as possible record them.
4. He should both record and collect his operative fee before operation.
5. He should see that the case has systematic, careful hospital preparation. I say "hospital preparation," for if you want to steer clear of malpractice suits, and particularly if you desire to be able on the witness stand to show the jury that you have taken every reasonable precaution, you will do all these operations in a hospital.
6. Finally, the case should receive careful after-treatment. I do not need to go into any discussion as to what is meant by these precautions, for you all know what they are.

Never operate during the progress of an acute inflammatory process in the throat. Of course, avoid mutilation. I have seen many throats where unwarranted suits were instituted that never came to trial, and I have been impressed with the number where the uvula has been removed during the operation. Make careful records before and after the operation, until the patient is dismissed. Inexperienced operators have little real defense in malpractice suits.

Now, as to court proceedings: the defendant does not have to give expert testimony, but should be qualified as an expert from an operative standpoint. The ordinary physician is about the worst witness I have ever seen on the witness stand. In giving his testimony, he should stick to facts and not make guesses. A physician who is giving testimony in his own case should stick to his notes and not try to give any other information of guesses, and particularly he should not try to give expert testimony. The confrere who is usually called to testify as an expert is usually permitted to examine the patient, and he is the man relied upon to state to the jury the exact condition of affairs. I must say that in all my experience I have seen very few cases where the suit was based upon any real, tangible, operative results that warranted any damages.

Finally, make yourself secure by carrying a large malpractice defense insurance. Don't take the chance of an accidental verdict against you that you will have to pay out of your own pocket. Carry more insurance than you think you will need, and you can rest in some security should malpractice suits be brought against you.

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## IN MEMORIAM.

### JOSEPH GRADENIGO.

The loss of this renowned otologist is not only a loss to Italy but to every other nation for this great professor was known throughout the civilized world. During the last thirty years he graced many Congresses; his articles appeared in many Journals; his scientific attainments and collaboration, his Latin geniality, his Italian versatility inherited from his glorious ancestors, once Venetian Doges, all contributed to his great renown so that his name belongs in the roster of great specialists such as Politzer, Bezold, Troeltsh, Luc, Lannois, Wilde, Pritchard, etc.

His inexhaustible activity was an example to the profession and even in the last days of his life he guided and ruled a cohort of Italian specialists. His unexpected death leaves a vacuum never to be filled.

Joseph Gradenigo was the founder of Otology in Italy thirty years ago and therein lies his greatest achievement for he not only initiated it but through his own and his pupils' researches he made of it a complete and complex science.

He was Professor at the University of Turin for twenty years where he was chief of a clinic to which he added ambulatories for the poor. His own private clinic with large laboratories for anatomic, pathological and bacteriological researches, equipped with modern appliances compared with those of the greatest foreign hospitals and clinics.

He left Turin for Naples to which university he was appointed after the death of Massei and here too he scientifically enlarged and enriched that clinic and added a psychophysiological laboratory which he himself directed. These clinics attracted numerous Italian as well as foreign specialists. It may be claimed that every city in Italy and even foreign cities with Italian colonies can boast of a well trained specialist reflecting Gradenigo's ability as a teacher.

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Nearly all of the military specialists are of his school. During the late war he founded a psychophysiological laboratory for aviators. Gradinego was not only active as a teacher and clinician but he contributed often to Congresses in Italy, England, America and other countries. He was the founder of the important Italian periodical "Archivio Otologia" and wrote for many foreign journals.

He founded the Italian Laryngological Society, was a member of many foreign academies and must be admired as a fervent patriot. As a Colonel of the Red Cross during the war he worked largely among the soldiers, receiving and attending the wounded in his private hospital. He also founded psychophysiological institutes providing for the modification of military regulations. Through his influence military hospitals adopted the rule of making reports in the specialties. Upon each of these activities he left the impress of his personality.

To his students he demonstrated his great predilection for the laboratory and to his patients at the bedside he disclosed his kind and generous nature.

The profundity of his investigations and the wide extent of his knowledge are apparent not only in the medical field. In his works of over one hundred publications may be found some dealing with the embryonic development of the ear, auricular manifestations of hysteria, diseases of the labyrinth, bacteriology of ozena, the pharyngeal tonsil, endocranial complications; others refer to otitic disturbances, to acumetry, to phonetics, deaf-mutism, telephonic acumeters or to dry air inhalers. With a facile delivery he combined clearness of thought and practical common sense. He spoke several foreign languages and showed his profound knowledge in every argument.

It was, therefore, well deserved that in Italy Gradenigo was looked upon as the ranking otologist and but natural that abroad his genial contributions, reflecting the progress of such an important branch of medicine, were sought and prized.

PROFESSOR F. LASAGNA,  
*University of Parma.*

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